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The American Journal of Obstetrics and Gynecology

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Original Communications

THE NASAL APPLICATION OF PITUITARY EXTRACT FOR THE INDUCTION OF LABOR*

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WITH THE COLLABORATION OF K. S. OLIVER, M.D.

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THERE can hardly be found in the history of medicine an example of a potent drug becoming so rapidly known throughout the medical world as the use of pituitary extract in obstetrics. Nevertheless, an acrimonious debate is still in progress as to whether the introduction by Hofbauer in 1911 of the use of pituitrin as a powerful stimulant of uterine contractions *during labor* represents an important development in modern obstetrics (V. E. Henderson, Guggisberg and others), or whether it should be considered as a questionable addition to our armamentarium, in view of the fact that certain untoward effects may be produced both upon mother and child when it is improperly used.

In face of the fact that the obstetrician finds himself in a maze of conflicting statements upon so important a subject, due credit must be given to the French committee which in 1925 made a clinical investigation of the question by means of a questionnaire sent to the prominent French and Swiss clinicians. Not considering a number of over-enthusiastic answers, the opinion prevailed that pituitary extract, with its power of producing regular, rhythmical and forcible uterine contractions, should be regarded as a most beneficent and valuable agent, which, however, should always be employed with care and a realization of its limitations and dangers.

Although practically no new ground has been broken since the indi-

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

cations and contraindications for the use of pituitary extract in obstetrics had been outlined by one of us (J. H.) in 1911 and 1912, it is noteworthy that in the recent literature on the subject, a warning note has repeatedly been sounded against the hypodermatic employment of 1 c.c. of the extract, which we had set and steadfastly maintained as the standard dose. Blair-Bell, Eversman, Jung, A. Stein and Framm, insist that the initial dose during labor should not exceed 2 to 5 minims. We do not propose to discuss this point beyond saying that our own experience in recent years is in accord with such statements.

It is the purpose of this paper to present a new method of application of pituitrin chiefly for the induction of labor, and to discuss its advantages over the technic employed up to this time. It should be emphasized at the outset that, up to the present, according to the recent studies of W. A. Scott, "there is no method of inducing labor that is absolutely free from danger to either mother or child, and more particularly Watson's method has some dangers for the child even with the best of technic. It is obvious that if one feels that there is at hand a safe method of starting labor, and especially one not requiring mechanical interference, one will likely feel justified in inducing it in many cases where there would be a hesitancy to use a method that was either dangerous or technically difficult."

The senior writer has employed pituitary extract for the purpose of inducing labor at, or beyond, term, since 1911, and he found that the most convenient method of giving it was by subcutaneous injection. In his several reports he emphasized, first, that the method cannot always be relied upon; second, that the chances of success are considerably greater in multiparae than in primiparae; third, that a certain period of noneffective, painless uterine contractions preceding the administration of the pituitary extract is essential for a good result; and finally, that the method was not effective in interrupting pregnancy before term. These conclusions were later confirmed by a number of investigators. B. T. Watson, in 1920, in attempting the induction of labor supplemented the well-known combination of quinine and castor oil by the hypodermatic administration of 0.5 c.c. doses of pituitary extract at half hourly intervals until labor set in or until six doses had been given. While Watson claims that his technic was successful in 90 per cent of his cases and gave rise to no maternal deaths and had a fetal mortality of just over 6 per cent, less favorable results have been obtained by others.

Williams, in following the same technic, obtained the desired results in approximately seven out of ten cases near term, but did not think its value was great in toxemic patients because it was useless before the last two months of pregnancy. Moreover, his observations led him to believe that the fetus was in some instances lost as the result of

interference with the uteroplacental circulation by the violent and prolonged contraction of the uterine muscle. DeLee does not use the method "as the action of pituitrin is not controllable." For further information on this subject the reader is referred to Scott's paper, which gives a comprehensive account of the opinions held by a number of clinicians on this Continent. Scott concludes that Watson's method has some danger for the child even with the best technic, and that it is due for the most part to the occasional tetanic contractions which sometimes follow the use of the drug.

It was the recognition of these shortcomings of Watson's technic which caused us to seek some method of improving it, aside from an endeavor to widen, if possible, the field of indications for its application. Two main considerations influenced our search for new channels through which pituitary extract may be absorbed in a more effective and at the same time in a less dangerous way. Since a consensus of opinion has developed that the best results follow the repeated administration of small doses during a number of hours, the desideration seemed to be to discover, if possible, whether the local application of pituitary extract to some mucous membrane, with a highly developed blood and lymph supply, would permit its *slow* and *steady* absorption. Needless to say, the avoidance of local injury to the tissues by the local use of the drug, constituted the first prerequisite. Having regard to the clinical experience that patients vary in their reaction to pituitary extract, the possibility of *withdrawing the drug* from the mucous membrane to which it had been applied, and thus preventing further absorption, as soon as the tendency of the uterus to pass into tetanic contraction became noticeable, was considered an essential feature of any attempt to replace the hypodermatic route.

In casting about for a convenient method which would answer both purposes, the *oral* administration of pituitary extract was first considered, largely because recent experimental and clinical work had determined the degree of absorption of various drugs and chemicals when orally applied. Thus, Lasch and Neumayer had noted that a marked elevation of the calcium level in the serum occurred within thirty to sixty minutes after oral administration of calcium chlorid, and Lasch and Brügel and others have shown that a certain degree of hypoglycemia follows the oral administration of insulin if certain precautions are rigidly observed. Various attempts have been made to ascertain whether the administration of pituitary extract by mouth can produce systemic reactions. Rowntree, Barker and Mosenthal report that they have observed no effect after its administration by the mouth, but Wolpe, Hamill, and Donaldson, on the contrary, have recently found that small doses per os do cause an increase in uterine and intestinal activity. No effect on blood pressure was noted. Donaldson claims to have been successful in treating cases of uterine

hemorrhage by oral administration of pituitary extract, and Morris and Weiss report similar results in a case of dyspituitarism, although it had generally been held that the extract is rendered inert by the action of the gastric juice or by the intestinal or pancreatic enzymes.

The striking effects of pituitary action after oral administration were clearly evidenced by the experimental work of Knaus, who showed that after a latent period of about eight minutes it exerted a marked effect upon the uterus, increasing both its tone and automatic movements. Since satisfactory evidence of an adequate resorption of the oxytocic substance from the sublingual region had been afforded by these experiments, the next step to be taken in transposing such observations into obstetric practice, was clearly indicated. It had, however, to be borne in mind, that our information as to the absorption rate of drugs in general when given by mouth is quite defective; and whether the alterations in the local conditions of the oral mucous membrane, which occur as a biologic response to the pregnant state, are apt to accelerate or retard the absorption of chemicals, still remained to be determined.

The method we employed last summer in 31 patients both for the purpose of inducing labor and of stimulating pains in cases of inertia uteri, consisted in the preliminary sensitization of the uterus by means of the well-known combination—hot enema, castor oil and quinine—followed by the subsequent administration of pituitary extract by mouth. A period of two to three hours was allowed to elapse between the preliminary preparation and the administration of the first dose of pituitrin in order to make sure that the former had not been sufficient to induce pains. In order to make the commercial preparation of pituitrin extract more palatable, about five grains of granulated sugar were added to ten minims of pituitrin and the whole diluted with water to one dram. Bearing in mind that Knaus had found the most rapid absorption occurred from the sublingual region, the patients were instructed to hold the mixture beneath the tongue for five or more minutes before swallowing it. Each dose was prepared from a fresh ampule of pituitrin just before its administration. Invariably uterine contractions ensued in from three to eight minutes. The contractions lasted from fifteen to ninety seconds and were separated by periods of relaxation of from one to ten minutes. In none of the patients did tetanic contraction of the uterus occur, although occasionally an abnormally high tonicity of the uterine wall was observed. Auscultation of the fetal heart showed no greater variations than are observed during the normal first stage of labor, while in normal, as well as toxemic patients, the blood pressure showed practically no variation.

Influenced by the technic employed by Watson, we repeated the oral administration of pituitary extract at half-hour intervals for four

doses, regardless of whether the contractions continued or not, unless definite labor pains supervened. Several of our patients began having real pains before the series of four doses was completed, but the great majority did not complain of pains until two to four hours after the last dose.

TABLE I

CASE	AGE	RACE	PARA	DURATION OF PREGNANCY	INDICATION FOR INDUCTION	DOSES OF PITUITRIN	RESULT	REMARKS
U 6696	20	C	I	2 weeks overterm	Overterm	4	Success	----------
U 6666	17	C	I	Term	Contracted pelvis	4	Success	Delivered by cesarean after trial of labor.
U 6644	34	W	V	Term	Hydramnios	4	Success	Excessive sized child.
U 7190	20	W	II	Term	Pro causa exercitii	4	Success	----------
U 7266	25	C	I	Term	Pro causa exercitii	4	Success	Intramural myomata.
U 7321	23	W	I	Term	Pro causa exercitii	4	Success	Cervical canal intact. Membranes ruptured prematurely.
U 7401	16	W	I	9 months	Pro causa exercitii	4	Failure	----------
U 7546	16	C	I	Term	Pro causa exercitii	4	Failure	Spontaneous labor 4 days later.
U 8073	38	C	VI	Term	Pro causa exercitii	4	Failure	Spontaneous labor 5 days later.
U 8120	21	W	II	9½ months	Pro causa exercitii	4	Failure	Spontaneous labor 13 days later.
U 6924	17	C	I	Term	Dead fetus	3	Success	Syphilis. Macerated child.
U 5876	23	W	V	9½ months	Pyelitis	4	Failure	Another failure 7 days later. Spontaneous labor two weeks later.
U 6672	34	W	VII	Term	Nephritic toxemia	4	Failure	Bougie inserted after fourth dose of pituitrin with prompt success.
U 6824	26	C	III	9 months	Mild toxemia	4	Failure	----------
U 2685	41	C	V	8½ months	Nephritic toxemia	4	Failure	----------
U 7501	20	W	I	Term	Nephritic toxemia	4	Success	Three previous unsuccessful attempts during the preceding 2 weeks. Child 45 cm. long, weight 2225 gm.
U 7856	19	C	I	9½ months	Mild toxemia	4	Failure	Spontaneous labor 16 days later.
U 1842	25	W	I	Term	Preeclamptic toxemia	4	Success	----------
U 4656	22	W	I	1 week overterm	Mild toxemia	4	Failure	Pains began 24 hours later.
U 7977	18	W	I	2 weeks overterm	Overterm	4	Failure	Spontaneous labor 4 days later.

We employed the technic above outlined for the induction of labor in 20 patients: 12 primiparae, 8 multiparae; 11 of whom were at term, 3 postmature, and 6 prior to term. The indications were—postmaturity, toxemia, severe pyelitis, dead fetus in utero, as well as pro causa exercitii in certain patients at or near term. Altogether, labor was successfully induced in nine out of the 20 patients,—an efficiency of 45 per cent. It might be mentioned that in five additional patients, induction followed the preliminary treatment alone, so that there was no necessity for giving the pituitrin.

Table I summarizes the results obtained by this method and gives details as to the indications and results in the individual patients.

In eleven additional instances the same technic was employed to stimulate pains in patients who were already in labor, but in whom the pains had stopped for a number of hours. In such cases, the method was employed irrespective of the degree of cervical dilatation and regardless of whether the membranes were ruptured or not. In ten of these cases a satisfactory result was obtained without ill effect to either mother or child. The following abbreviated history illustrates the course of events in one of the successful cases.

A 28 year old colored para iii, at term. Admitted 6 P.M., 8/29/26. Vague pains. Cervix 3 cm., head floating in L. O. A. Patient slept throughout the night,—no pains. At 8 A.M., 8/30/26, induction started by hot soap suds enema and a hot drink. 9 A.M. 1 ounce of castor oil and 10 grains of quinine sulphate by mouth. Quinine repeated at 9:30 and 10 A.M. At noon conditions the same as 18 hours previously. At 12:30 P.M. pituitrin mx by mouth was given. Good contractions began. Pituitrin repeated at 1, 1:30 and 2 P.M. After the last dose, regular pains at 8 minute intervals. Delivered spontaneously at 9:40 P.M. Child in excellent condition, 2860 gm.

In summing up, it is interesting to note that in this series the oral administration of pituitary extract rendered efficient service in stimulating uterine contractions in a certain number of cases. As the results obtained could not be considered as ideal, it was only natural to attempt to discover some other portal of entry, from which the pituitary extract could be absorbed more satisfactorily. Upon reviewing the various pathways through which drugs are known to be absorbed, our attention was directed particularly to the nasal route, as the result of certain fundamental findings by H. W. Freund, who reported that definite changes could be observed in the mucous membrane covering the inferior turbinate bone and the tuberculum septi as well—hyperemia, swelling, hypertrophy, in two-thirds of all pregnant women. These changes have their counterpart in the pregnancy reaction first described by Hofbauer in the interarytenoid region of the larynx. Moreover, following Fliess' suggestion that some relationship exists between certain areas of the interior of the nose and the female generative tract, various experimental and clinical investigations made

during the last two decades brought to light a number of facts in support of this idea. In this connection, we would refer to attempts made in the Vienna clinic to relieve labor pains and dysmenorrhea by the local application of cocaine to the inferior turbinate bone; as well as to the interesting recent observations of Abel and Geiling, Rowntree, and Blomgard that the application of pituitary extract to the nose leads to beneficial results in cases of diabetes insipidus.

ANATOMIC CONSIDERATIONS

Before considering the technic employed in the nasal administration of pituitrin to our patients, we shall briefly review certain points in the anatomy of the nose which are of importance in this connection.

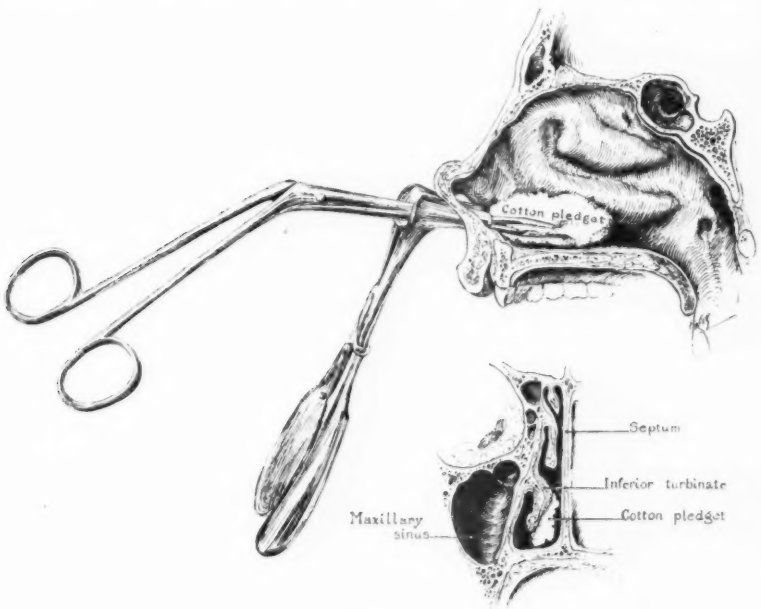

FIG. 1.

The accompanying semidiagrammatic representation of the lateral nasal wall shows the turbinate bones, and particularly the inferior turbinate bone, which extends throughout the entire length of the floor of the nasal cavity. Under normal conditions, the mucous membrane covering the inferior turbinate is a spongy, highly vascular, erectile tissue, and it is now universally admitted that the vascularity and tendency to engorgement are markedly increased during pregnancy. Beneath the surface epithelium lies a connective tissue stratum rich in mucous glands, lymphatics and blood vessels, an extensive network of large venous sinuses being particularly prominent. Of the lymphatic distribution in this region, little is known, as attempts to trace it by injection have always failed, because of simultaneous in-

jection of the vascular bed. The direct drainage, however, is into the deep cervical lymphatics.

In connection with the therapeutic utilization of the nasal mucosa, great interest attaches to the possible routes along which absorption may occur. Among other possibilities, it is interesting to inquire whether material absorbed from the nasal mucous membrane can pass through lymphatic channels directly to the subarachnoid space. While there is not complete agreement on this point, certain observations, notably those of Simon Flexner, speak strongly in its favor. He believes that in acute anterior poliomyelitis the pathway of infection is through the upper respiratory tract, and his experiments point to the passage of organisms from the nasopharynx to the subarachnoid space along lymphatics which accompany the filaments of the olfactory nerve.* Furthermore, Schloss emphasizes the fact that, in children, a surprisingly small patch of inflammation in the nasopharynx may excite convulsions, stupor and other phenomena indicative of considerable cerebral irritation. Other observers have reported the recovery from the cerebrospinal fluid of dyes previously injected into the nose. Again, in recent years, a great deal of interest has centered around the presence in the adult of an additional cranial nerve, which is distributed to the mucosa of the nasal septum,—N. terminalis. According to the studies of Johnston numerous small groups of ganglion cells are interspersed along both the peripheral and intracranial course of this nerve, whose central connections with the frontal portion of the brain are in the form of two or three roots which pass through the cribriform plate of the ethmoid bone in company with the vomeronasal nerve. Moreover, when one considers the extraordinary richness of the vascular and lymphatic beds in the turbinal mucous membrane itself, it seems obvious that solutions applied to it would pass almost immediately into the general circulation both by blood stream and by lymphatic absorption, and we believe that this direct absorption is far more important than the meager and circuitous olfactory terminalis route described above. Taking all of these considerations into account, we assumed that this pathway might possibly be utilized for our purposes, and we decided to subject it to clinical investigation.

TECHNIC

The following technic was developed. Under direct vision, with the aid of a nasal speculum and reflected light, the nose is carefully examined and cleaned of any crusting or discharge. A small pledget of cotton of such size as to fit easily, but snugly, between the septum and the inferior turbinate is then prepared, and after being moistened with twenty minims of pituitary extract is inserted under the anterior end

*Weed's studies showed that a pathway exists between the subarachnoid space and the lymphatic spaces beneath the nasal mucous membrane.

of the inferior turbinate (see Fig. 1). Obviously, if the procedure is to be successful, it is important that the impregnated pledget should lie in snug contact with the absorbing surface rather than loose in the nasal cavity. If the pledget is inserted gently, the patient does not experience any appreciable discomfort and in none of our cases was it necessary to resort to a local anesthetic.

Hoping to effect a continuous but slow absorption of pituitary extract, we at first applied a pledget containing ten minims of the drug to each nostril. The first change noted was a marked increase in fetal movements which almost routinely preceded the first uterine contractions, the latter coming on invariably within one to five minutes after application of the drug. These first contractions were timed and the fetal heart auscultated at frequent intervals. In the event that a contraction lasted longer than four minutes, or the fetal heart showed untoward changes, the pledgets were immediately withdrawn, after which the tetanic contraction always subsided in from one to five minutes with coincident complete recovery of the fetal heart. Subsequently rhythmic contractions alternating with periods of relaxation continued, and usually in such cases no further administration of the drug was required. We noted that the longest contractions came on almost immediately after the pledgets were introduced, so that if no tetanic contraction occurred during the first twenty minutes, we considered that the danger from such an accident had passed. Unless true labor pains set in within two or three hours, the contractions gradually became shorter and weaker and recurred at longer intervals. Accordingly, when it became evident that the effect of the first administration was wearing off the pledgets were removed and replaced by fresh ones containing the same amount of pituitrin. In the majority of our cases, one to three applications were required for a successful induction of labor, but in a very few cases as many as five doses were necessary. The pledgets on removal were always heavily coated with mucus, suggesting that some time had probably elapsed since any appreciable amount of pituitrin had been able to break through the mucous barrier and be absorbed. This point was further substantiated by the observation that the original blanching effect on the nasal mucous membrane had always disappeared when the pledget was removed after having been in place for as long as one hour. In addition, the presence of pledgets in both nostrils for such long periods of time caused considerable irritation to the mucous membrane, which apparently increased the amount of mucus secreted and thereby lessened the effectiveness of subsequent administrations.

Realizing that by this method the absorption was occurring in waves rather than continuously, and bearing in mind the changes produced in the nostrils, we revised our technic by increasing to 20 minims the amount of pituitrin on a single pledget and applying it to one nostril

only. At the end of one hour, or at most two hours, the pledget was withdrawn, and a fresh one applied to the opposite nostril for a similar period of time. This not only allowed each nostril a period of rest, but also gave the patient one free nasal passage for breathing, thereby diminishing the discomfort and assuring her more active cooperation. No marked changes were observed in the nasal mucous membrane following repeated applications of pituitary extract. In some cases there appeared to be temporary shrinking, but this was not constant. A number of patients experienced, however, for several hours afterwards, the symptoms of a mild coryza, but no other untoward local effects were observed.

The local conditions of the nostrils are of great importance to the successful outcome in the individual cases. Any abnormal condition, such as an acute coryza, profuse lacrimation, or a chronic catarrhal inflammation militates against absorption. Even the normal accumulated output of mucus evoked by the presence of the cotton pledget becomes sufficient within one to two hours to diminish decidedly the resorption of the drug.

CLINICAL OBSERVATIONS

Up to the present time, we have employed the nasal method of inducing labor in 80 patients, 26 of whom were treated by our original technic and 54 by the improved method just outlined. Since a detailed report of the individual cases seems unnecessary, we shall only summarize our results.

Seven failures occurred in the first series of cases, before our technic had become perfected; whereas but a single failure was noted in the second series. Two factors may possibly be invoked in explanation of this result. First, as was suggested by Watson, an important feature in any method of inducing labor by means of pituitary extract consists in the administration of a second dose before the effect of the first has worn off. Secondly, it seems quite probable that the failure in some of the cases in our first series was due to the fact that only a fraction of pituitary extract was absorbed, as the result of a lack of firmness of application of the pledgets to the inferior turbinate bone.

The following are our indications for the induction of labor:

I	Toxemia	32 cases
II	Postmaturity	15 cases
III	Severe pyelitis	5 cases
IV	Hydramnios	2 cases
V	Dead fetus	2 cases
VI	To test the method in normal pregnant women during the last month of pregnancy and at term	24 cases

In groups I-V (56 cases) labor was induced successfully in every instance. On the other hand, nine failures occurred in the sixth group. Here we found that when the cervical canal measured 2 or

more cm. in length and the external os was tightly closed, that the chances of success are comparatively poor; while the prospects are much better when the cervical canal is obliterated. This observation is quite in harmony with the results of Knaus' recent experiments which indicate that considerable changes occur in the relationship between the hypophysis and the uterine muscle during pregnancy, and that as the result of an increase in the sensitiveness and the tone of the uterine muscle toward the end of pregnancy, labor can be induced in animals at term by comparatively small doses of pituitrin, which are entirely ineffective before term.

Of the 32 toxemic cases, nine were of the nephritic, 17 of the preeclamptic, and six of the "vascular" or hypersensitive type (showing excessive high blood pressure associated with but a trace of albumin). In the entire series of toxemic cases, eight were at term, 22 from two to four weeks before term, and two seven months pregnant. It is interesting to note that in none of them did the blood pressure rise materially over the initial level during the course of the induction. Moreover, it is significant that in the preeclamptic cases, labor was induced with the greatest ease, one application of pituitary extract often being sufficient; whereas greater difficulty was encountered in the nephritic cases. The response of the "vascular" type of cases to the pituitary extract was somewhat similar to the observations made in the preeclamptic cases. Although no failure occurred in either group, it was a characteristic feature of the nephritic type that the response was definitely less pronounced. As an illustration, a case may be cited in which we were obliged to resort to the artificial rupture of the membranes after labor had come to a standstill, with the cervix dilated to 3 cm. At this point, it is important to state that the artificial rupture of the water-bag is of great value in bringing to a quick and successful end any induced case which seems about to fail for want of satisfactory pains. As a matter of experience, however, the procedure mentioned was resorted to in only seven out of all our cases. In four preeclamptic cases, there was observed a tendency on the part of the uterus to pass into tetanic contraction, which probably indicated that the organ was unusually susceptible to pituitary extract; thus affording a reasonable explanation for the ease with which labor can be induced in this variety of toxemia. Bearing in mind the sensitiveness of preeclamptic patients to pituitary extract, we are now restricting in that type of patient, the initial dose of the drug to 10 drops, adding water to dilute the extract so that both quantity and potency are diminished. Later, if the patient proves less sensitive than we anticipated, the dosage is built up.

In all the postmature cases, labor was successfully induced at the first attempt. Labor was likewise induced without difficulty in two cases (parae VI) of dead fetus in utero, at the ninth month and at

term, respectively; in the first case death due to an unknown cause, and in the other, to syphilis.

In conclusion we wish to say that in a few cases, quinine was discarded from the usual preliminary preparation of the patients on account of their idiosynerasy to this drug. But in these cases, no difference in their response to pituitary extract was noted. Finally, several cases at term were observed where an apparent failure followed the applications of pituitary extract. These patients, however, fell into labor spontaneously in less than twenty-four hours thereafter. Furthermore, it may be mentioned that we have also found the nasal method of application of pituitary extract a safe and efficient procedure for accelerating labor already in progress, although further experience will be necessary before its employment can be standardized.

COMMENT

The fact that in our series all of the babies were born alive, testifies to the control we now possess over the action of pituitary extract when used both for induction of labor and for accelerating labor already in progress. The nasal administration of the drug demands a constant attention for the succeeding twenty minutes. The possibility of withdrawing the drug and thus preventing its further absorption as soon as the uterus passes into tetanic contraction, renders the nasal application of pituitary extract the safest method yet available for obstetric purposes.

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OBSERVATIONS ON THE PARIETAL FONTANELLE IN THE NEWBORN AND IN YOUNG INFANTS

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IT IS not unusual to find irregularities of ossification along the course of the parietal portion of the sagittal suture in newborn infants and very young children. These irregularities have been the subject of a number of studies, for they are sometimes of considerable practical importance in obstetrics. The presence of localized and definite enlargements of the parietal portion of the sagittal suture is said to have been noted by Albinus in the eighteenth century, although the first clear description of the parietal fontanelle was given by Gerdy (1837). Subsequent papers touching on this subject were published by Hamy (1871, 1872), Le Courtois (1870), Maggi (1896), Lee (1898, 1899), Frassetto (1900, 1903), and others. The fontanelle has received a number of names, including the parietal fontanelle, the sagittal fontanelle, the accessory sagittal fontanelle, the obeliac fontanelle and the fontanelle of Gerdy, after its supposed discoverer. This fontanelle is not recognized in the B N A terminology.

Studies of the parietal portion of the sagittal suture in early life have been made by two methods: First, by the examination of prepared skulls or fresh skulls at postmortem, and second, by the simple palpation of this region in the living. Both of these methods have certain disadvantages. The first is commonly limited to a small amount of material which is often of uncertain history. The second, as commonly applied, gives no quantitative record of findings.

The present study is based upon the examination of the parietal portion of the sagittal suture of 598 living newborn infants and children of the first and second years. All of these children were full term, healthy infants, and all cases with clinical evidence of rickets were rejected. Otherwise there was no conscious selection of material. These observations were made with the following technic: The child's head was held by an assistant, and the observer passed a strip of closely woven linen cloth, approximately 4 cm. wide and 20 cm. long, over the sagittal arc of the cranium, from the forehead to the occiput. While this strip was held firmly in place the fontanelles and sagittal suture were palpated through it, and their outlines traced upon it with an indelible pencil. The record was completed by not-

ing the child's age, sex, weight and total crown-heel length on the strip. After a little practice this method was found to be a fairly accurate one, and the outlines of the fontanelles thus obtained could be measured with considerable precision. Our findings from these data may be summarized as follows:

TABLE I. FREQUENCY OF THE PARIETAL FONTANELLE IN INFANCY

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	NUMBER OF CASES SHOWING DEFINITE ENLARGEMENTS OF PARIETAL PORTION OF SAGITTAL SUTURE	PERCENTAGE OF CASES SHOWING DEFINITE ENLARGEMENTS OF PARIETAL PORTION OF SAGITTAL SUTURE
0 to 30	241	74	30.70
30 to 60	90	25	27.78
60 to 90	30	4	13.33
90 to 180	83	1	1.20
180 to 270	59	0	0.00
270 to 360	47	0	0.00
360 and over	48	0	0.00
Totals and means	598	104	17.39

I. FREQUENCY

Table I shows a frequency of interparietal spaces. Definite localized enlargements of the interparietal suture were found in 104 of the 550 infants of the first year which we examined, a frequency of 18.9 per cent. In the first month this frequency was 30.7 per cent, in the second month 27.8 per cent, in the third month 13.3 per cent, and in the second trimester (90 to 180 days) 1.2 per cent. These frequencies are much higher than any reported by previous observers. Le Courtois (1870) states that the space was present in 5 of the 175 newborn infants he examined, a frequency of 2.9 per cent. Lee (1899) who examined 500 living newborn infants, found a definite parietal fontanelle in 22 instances, or 4.4 per cent, but it is evident that this observer threw out a number of individuals with small parietal fontanelles, for he remarks that, "In each of these cases a well-marked membranous space was present. Cases which showed only a notch in the parietal bone in this region were more frequent, and were not included in this table." The comments following the presentation of Lee's paper, however (which are printed in conjunction with the paper in the *Transactions of the Obstetrical Society of London*), indicate that most of his hearers regarded this frequency as higher than they had encountered in practice. Williams (1923) also considers the percentage of 4.4 as above the normal, and estimates the usual frequency at about 1 per cent in mature newborn children.

It seems probable that the discrepancy between our figures and those of other observers lies largely in the definition of the term "fontanelle." Most obstetricians seem to have limited this term to

the designation of spaces of sufficient size to be of practical importance in midwifery, while we have applied it to all definite membranous spaces along the course of the parietal portion of the sagittal suture, regardless of their size. If we limit the count in our series to spaces having an area of 1 square centimeter or more, which perhaps approximates the size of a fontanelle as definitely palpated by the index finger, the number for the first year falls to 18, or approximately 3.27 per cent of the total number of cases for this period. The percentage of cases with palpable fontanelles similarly estimated for the first month is 5.8, and for the two succeeding months it is 3.3 in each. These figures are not very different from those reported by Lee. It is hardly possible that the greater frequency of this fontanelle which we have encountered is due to our technic, for we find that our measurements of the great or frontal fontanelle made by this method are somewhat smaller than those of other observers, who have employed the method of palpation and direct measurement upon the head of the living child.

II. SIZE AND INVOLUTION

As shown in Table I, there is a constant postnatal involution of this fontanelle, as indicated by its frequency in groups of unselected cases in graded time intervals. Although the relative frequency in the second month is but slightly less than in the first, it is less than half as great in the third month and is but 1.2 per cent of all cases of the second trimester of postnatal life. We encountered no instances of this fontanelle in the 154 children over six months of age which we examined. That the parietal fontanelle may occasionally exist beyond the close of the second trimester is indicated by Lee's findings, for this author noted two instances of fontanelles between six months and one year.

The fontanelle is so irregular in outline that lineal measurements of it have little value. It is possible, however, to estimate the area in many instances. We were able to make this determination for 67 of the 104 tracings in our series. In the other 37, the space was confluent with other fontanelles or the outline of the tracing was not sufficiently sharp to allow accurate measurement. The areal determinations were made directly from the fontanicular tracings with an Amsler polar planimeter. The values thus obtained are shown in Tables II and III.

The average area of the measurable tracings of infants of the first month is 0.14 square cm., and the mean value for the second month is 0.13 square cm. There were only 2 measurable tracings of children over two months of age and these had a mean value of 0.09 square cm. There is a constant decrease in the maximal areas of the fontanelle in the first trimester.

TABLE II. FREQUENCY OF PARIETAL FONTANELLES OF ONE SQUARE CENTIMETER OR OVER IN AREA

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	NUMBER OF PARIETAL FONTANELLES 1 SQ. CM. OR OVER IN AREA	PERCENTAGE FREQUENCY OF PARIETAL FONTANELLES 1 SQ. CM. OR OVER IN AREA
0 to 30	241	14	5.81
30 to 60	90	3	3.33
60 to 90	30	1	3.33
90 and over	237	0	0.00
Total and mean	598	18	3.01

TABLE III. AREA OF THE PARIETAL FONTANELLE IN MEASURABLE CASES

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	TOTAL NUMBER OF CASES SHOWING PARIETAL FONTANELLES	TOTAL NUMBER OF CASES WITH MEASURABLE PARIETAL FONTANELLES	AREAS OF MEASURABLE PARIETAL FONTANELLES (SQUARE CM.)	
				MEAN	MAXIMUM
0 to 30	241	74	53	0.14	0.55
30 to 60	90	25	12	0.13	0.25
60 and over	267	5	2	0.09	0.15
Totals and means	598	104	67	0.137	

We were able to secure a few cases in which we could trace the fontanelle for a considerable period in the same individual. Three of these cases showing the involution of the space are illustrated in the tracings forming Fig. 4.

III. FORM AND POSITION

The form of the fontanelle is highly variable. While usually ovoid or diamond shaped in outline, a variety of bizarre shapes are encountered. Confluence with the frontal fontanelle, or the occipital fontanelle is not unusual. Typical outlines of the parietal fontanelle are shown in the tracings forming Figs. 1 and 2. Unilateral fontanelles, indenting but one parietal bone, are not uncommon. We encountered 11 in the series of 104 fontanelles (10.6 per cent). Duplications of the parietal fontanelle, likewise, are not particularly unusual. They were present in 16, or 15.4 per cent, of our series. In one instance there were three parietal fontanelles present. These duplications may be either confluent or may be separated by considerable segments of the sagittal suture along which the medial margins of the parietal bones are approximated. Rauber (1906) has noted similar duplications of the metopic fontanelle in the frontal portion of the sagittal suture.

It is generally stated that the fontanelle is located rather constantly at the level of the parietal eminences. While we have found this position to be the rule, the presence of this space in other segments of the parietal portion of the sagittal suture is not particularly uncommon.

IV. GENESIS

The origin of this fontanelle has been explained in two ways. It has been suggested that it is due to the local "suppression" of bony trabeculae radiating from a single ossification center located in the position of the parietal eminence, but no adequate theory of the cause of this suppression has been offered.

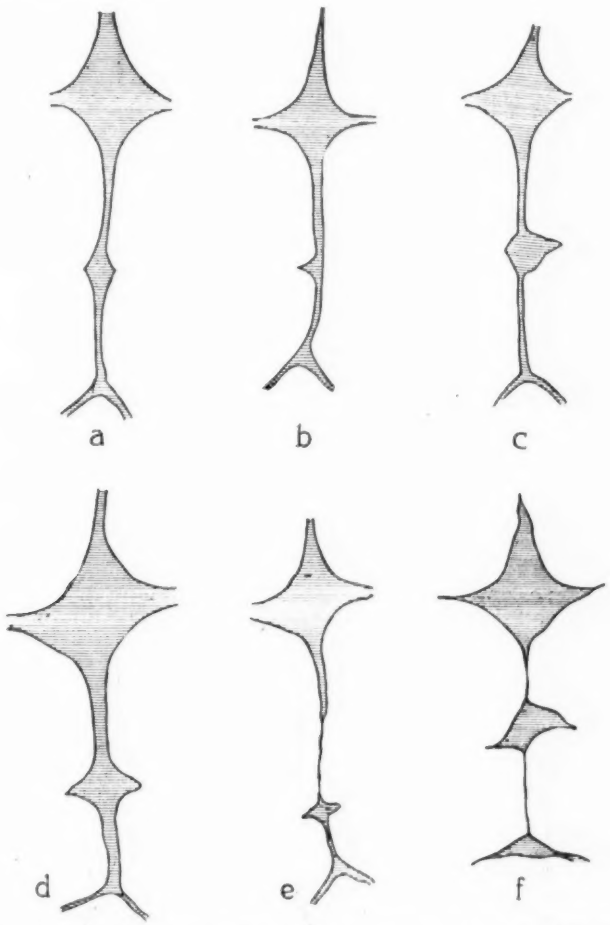

Fig. 1.—A series of tracings of the parietal portion of the sagittal suture showing typical parietal fontanelles. (*a*), Female, 34 days old; (*b*), female, 3 days old; (*c*), female, 7 days old; (*d*), female, 5 days old; (*e*), male, 36 days old; (*f*), newborn female.

A second explanation is that presented by Frassetto in connection with his theory of the fontanelles. Frassetto points out that, in theory, fontanelles may be expected at any point on the brain case which is equidistant from three or more ossification centers. Each such point forms a focus at which the margins of bones growing from these ossification centers may be expected to make their final contacts, and,

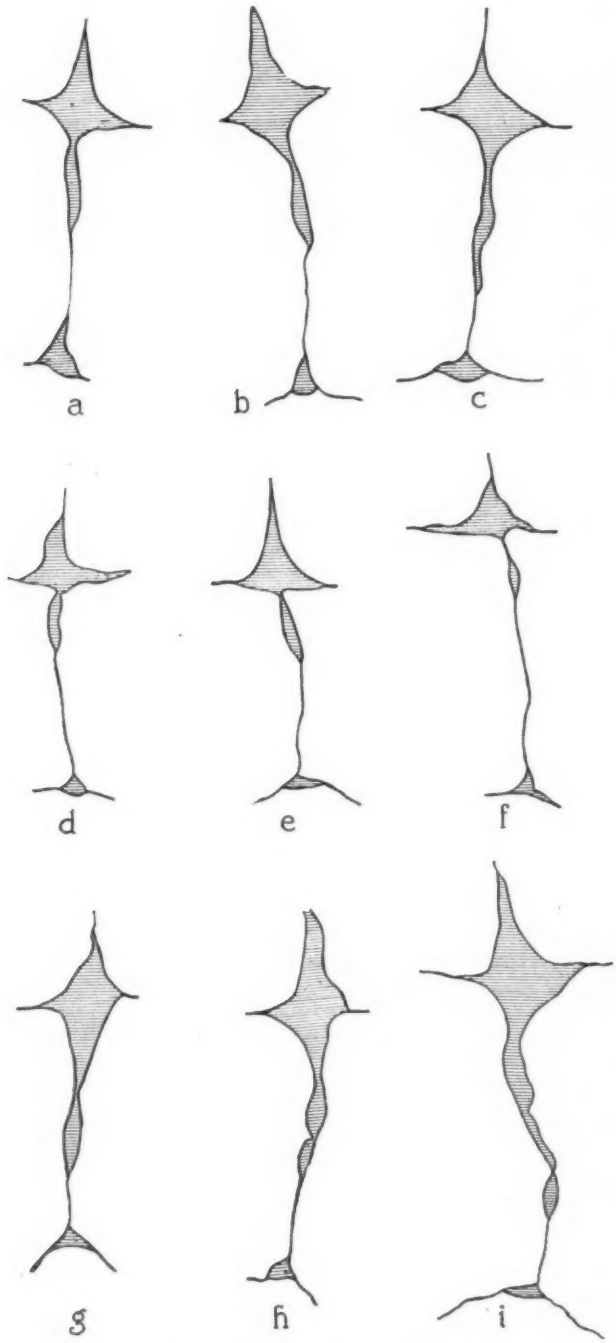

Fig. 2.—A series of typical tracings of the parietal portion of the sagittal suture showing a series of parietal fontanelles which were presumably formed by extensions of the great or frontal fontanelle. (*a*), Male, 30 days old; (*b*), newborn female; (*c*), female, 15 days old; (*d*), newborn male; (*e*), newborn female; (*f*), female, 24 days old; (*g*), male, 25 days old; (*h*), newborn female; (*i*), male, 28 days old.

prior to the time of making these contacts, an unossified area or fontanelle would occupy this position. He locates 27 such points on the human cranium and finds that constant or occasional fontanelles have been found at 22 of these positions.

According to this theory, parietal fontanelles would be formed whenever there is an anteroposterior duplication of the parietal ossification center, and when these centers remain separate for any considerable period. Such duplications of the parietal center are quite common, according to the studies of Toldt (1882) and others.

It seems very likely that a certain number of the parietal fontanelles do arise in this fashion for many of our tracings of these spaces have sharp-cut, diamond-shaped outlines which might be expected to occur when four bony margins approach one another and are growing

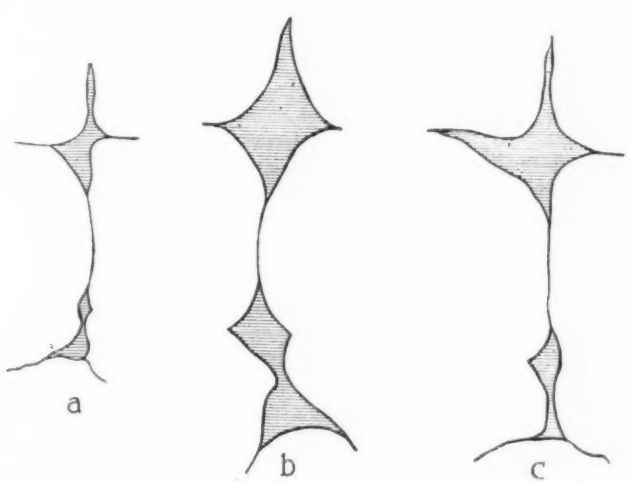

Fig. 3.—A series of tracings of the parietal portion of the sagittal suture, showing parietal fontanelles which are continuous with the occipital fontanelle. (*a*), Male, 18 days old; (*b*), female, 5 days old; (*c*), male, 24 days old.

towards a common focus. Others are sharply triangular in shape, suggesting approximation of three such margins. The first class may be regarded as representing instances in which the parietal ossification center was duplicated on both sides, and the second class those in which the parietal center was duplicated on one side only. Examples of fontanelles which may have had this origin are shown in Fig. 1.

A certain proportion of these fontanelles, however, appears to arise in a quite different way, by cutting off of posterior extensions of the great or frontal fontanelle. The origin of these cases may be compared with that described by Schultz (1918) for the origin of the metopic fontanelle from anterior extensions of the frontal one. This origin, by extension and isolation of the posterior part of the frontal fontanelle, can be easily demonstrated in an extensive series of trac-

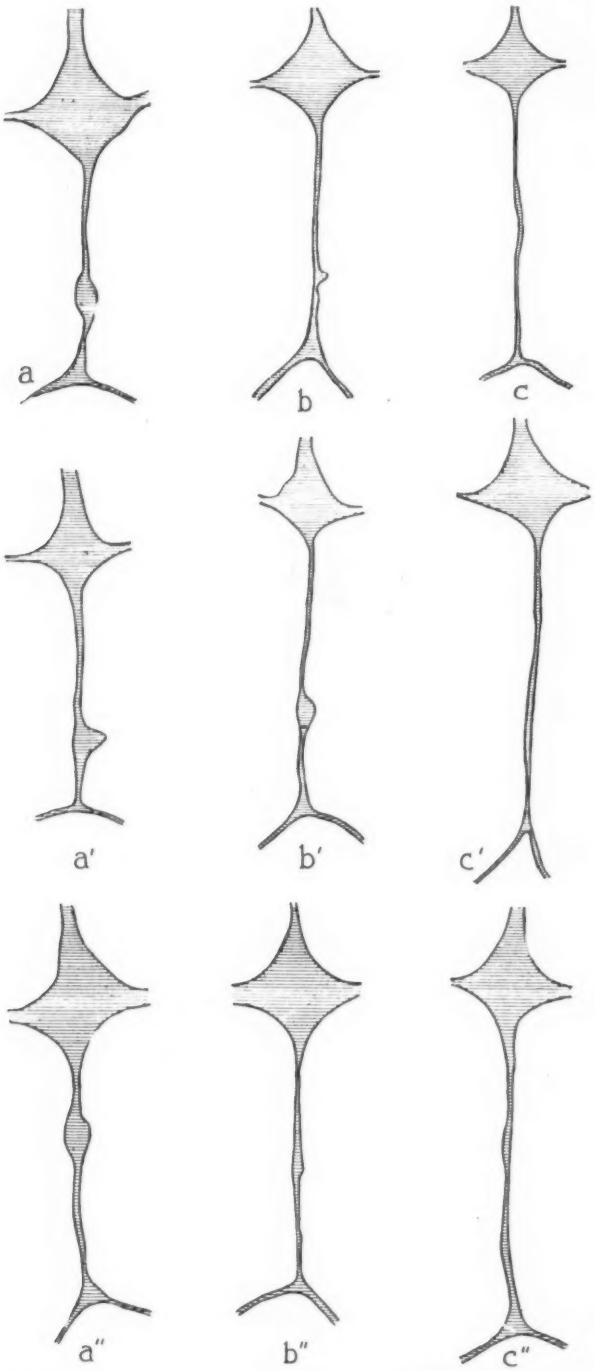

Fig. 4.—Three series of tracings showing the involution of the parietal fontanelle. (*a*), Female, 31 days old; (*b*), the same child at 82 days; (*c*), the same child at 140 days; (*a′*), female, 40 days old; (*b′*), the same child at 62 days; (*c′*), the same child at 140 days; (*a″*), male, 39 days old; (*b″*), the same child at 100 days; (*c″*), the same child at 180 days.

ings of the parietal region in early infancy, for all gradations are found from rather typical frontal fontanelles with posterior prolongations into the interparietal region to instances in which the frontal and parietal fontanelles are completely separated. Fig. 2 shows 9 examples

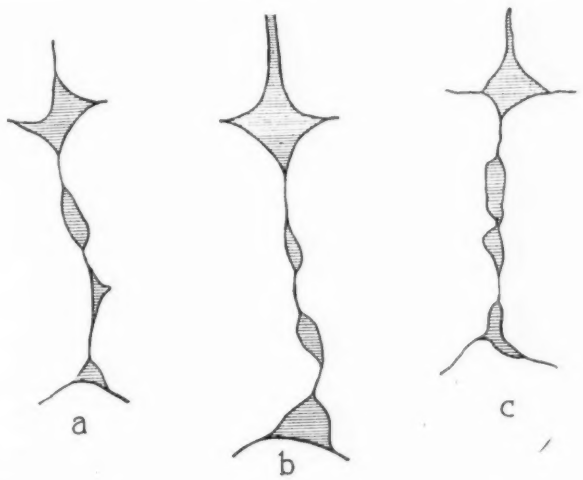

Fig. 5.—Three tracings of the parietal portion of the sagittal suture showing duplications of the parietal fontanelle. (*a*), Newborn male; (*b*), newborn male; (*c*), female, 28 days old.

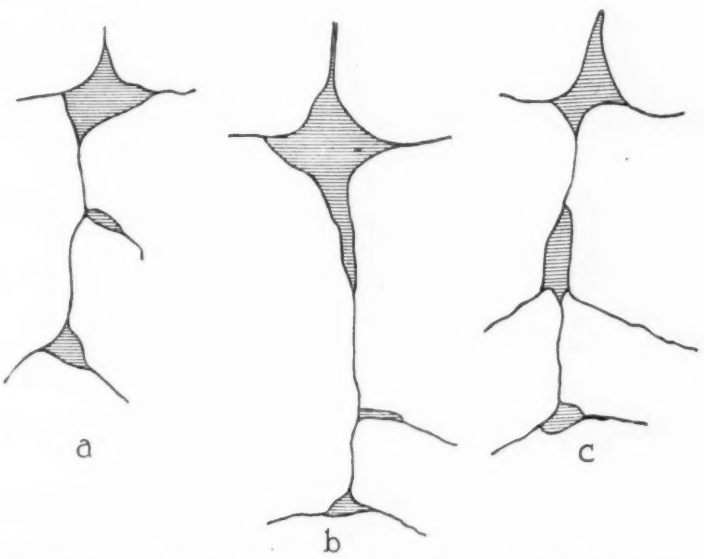

Fig. 6.—Three tracings of the parietal portion of the saggital suture showing parietal fontanelles associated with fissures of the parietal bone. (*a*), Female, 30 days old; (*b*), male, 17 days old; (*c*), female, 21 days old.

of fontanelles which appear to be either formed, or in the process of formation by this method. In our series of 104 tracings of parietal fontanelles we found 16, or approximately 15.4 per cent, which seem

to have arisen from posterior extensions of the great or frontal fontanelle. In fact the number may have been much higher, since it is impossible to determine the origin of fontanelles which are almost obliterated and have lost their characteristic form and connections.

We have not been able to determine with certainty whether the fontanelle may arise by anterior extension from the occipital fontanelle, as well as by posterior extension from the frontal one. In three instances, which are illustrated in Fig. 3, the parietal fontanelle was confluent with the occipital one, but in all of these cases the parietal fontanelle had the rather sharp angles which seem characteristic of those fontanelles which arise through duplication of the parietal center of ossification. Certainly if parietal fontanelles arise through the anterior extensions of the occipital bone, the number thus formed must be relatively small.

V. Association of the Parietal Fontanelles with Clefts of the Parietal Bone

Several observers have noted instances in which parietal fontanelles were associated with partial or complete subdivisions of the parietal bone. We observed four such cases in this series. Three of these are shown in Fig. 6. In only one instance did the cleft appear to be a complete one, and in only one instance was it bilateral. In the three unilateral cases noted, the cleft was incomplete and involved only the right parietal bone. We did not find any fontanicular bones in the series of infants examined but it is quite possible that the technic employed would not distinguish these structures if they were present.

Résumé

1. The relative frequency of interparietal spaces as determined from a study of 598 healthy living children is 30.7 per cent for the first month after birth, 27.8 for the second month, 13.3 per cent for the third month and 18.9 per cent for the entire first year.

2. The relative frequency of interparietal spaces or parietal fontanelles of 1 square centimeter or over in area, in this series of cases, is 5.81 per cent for the first month after birth and 3.33 per cent for the second and third months.

3. The persistence of the parietal fontanelle after the first trimester is unusual. We found only one instance in our cases of the second trimester and none thereafter.

4. The average area of the parietal fontanelle (in measurable cases) for the first trimester of postnatal life is 0.14 square centimeters in this series.

5. The form of the parietal fontanelle is highly variable. The parietal fontanelle is often confluent with the frontal fontanelle, and

occasionally with the occipital fontanelle. Duplications of the parietal fontanelle are not unusual.

6. Although the parietal fontanelle is usually located at the level of the parietal eminences, it may occur at any place along the interparietal portion of the sagittal suture.

7. Certain of the parietal fontanelles probably have their origin from duplications of the parietal ossification centers, but we think that a number are formed from posterior extensions of the great or frontal fontanelle. A few parietal fontanelles may arise from anterior extension of the occipital fontanelle.

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A STUDY OF THE INFANT'S BIRTH-WEIGHT AND THE MOTHER'S GAIN DURING PREGNANCY*

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A GROWING tendency to emphasize the value of competent medical supervision during pregnancy finds full justification in the excellent results thus obtained, as compared with the less satisfactory outcome when this period has been treated indifferently, or neglected altogether. Indeed, familiar studies from many sources uniformly confirm the benefits of "prenatal care" which merely means suitable directions for the maintenance of health and periodic observations to detect promptly the signs and the symptoms of approaching complications. Some of these complications relate to autointoxication arising from disordered metabolism and from that standpoint, everyone agrees, the prospective mother should receive specific advice regarding her diet. Beyond this, however, it is still a question whether the diet

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to be used in pregnancy merits attention. Some obstetricians regard the appetite as a trustworthy guide; others advise their patients to eat much less than they would naturally enjoy. The latter group believes that some relationship exists between the mother's consumption of food and the weight of her baby at birth. And, a baby of moderate size, they insist, favors the mother's welfare sufficiently to justify moderation in her diet.

Of course, nothing is more characteristic of pregnancy than the fact that it is a period of growth. The germ cells contributed by the parents contain an exquisitely small amount of material; after fertilization, normal progress requires the acquisition of suitable amounts of the foodstuffs. In oviparous animals the supply of nutriment for the development of the embryo has been stored in the egg and the quantity of material, thus provided, may not be subsequently changed. In the case of mammals, however, the material for embryonic development passes gradually and continually from the mother throughout gestation. Not unlikely with this arrangement, the maternal supply of nutriment may be influenced by conditions that affect her from time to time during this period. On theoretic grounds, at least, when the mother has been favored with respect to good health, sedentary habits and a plentiful supply of food a larger fetus would be expected than if the opposite conditions prevailed. Contrasts of this kind have actually been observed by physicians who practice among the well-to-do and who also give their services to clinics provided for the poor.

When life was simpler, perhaps, the proper diet during pregnancy was safely left to the mother's appetite. Now, unfavorable influences have come into play, influences which in our own country at least include the temptations of the soda fountain and the sweet shop. Whatever the correct explanation for the current situation, it is desirable at present that the directions given for the maintenance of health during pregnancy should include definite advice relative both to the kind of food and the quantity of it that is wholesome. It is impractical, of course, to control rigidly the diet of the average obstetric patient, as is done for example in cases of diabetes, for it is neither necessary nor desirable in uncomplicated pregnancy to restrict the diet unduly. If the gain in weight is observed systematically through the course of pregnancy, the food-consumption may be fairly regulated. The use of the scales, always of the greatest interest to the patient, frequently serves more effectively to secure her cooperation toward a proper way of living than do the routine examination of the urine and the regular observation of the blood pressure. Thus, watchfulness of the weight during pregnancy becomes of the very first importance; there is, in fact, no more helpful feature of the routine conference which should be held never less than once a month from early pregnancy until full term is reached.

It is a matter of common experience that patients who take on weight excessively during pregnancy are prone to difficult labors. Generally, this result is attributable to overgrowth of the fetus and in such circumstances the hazard for the baby also becomes appreciably greater. Some method of control here would serve to simplify the problems of parturition and naturally this has been sought from time to time, most frequently by one modification or another of the mother's diet. The results are difficult to interpret for various reasons, but chiefly because one seldom knows whether the diet prescribed has been conscientiously followed. Obviously, then, it is hazardous to advocate a specific diet and we would make it clear that we do not do so. It is not unlikely that similar results would follow the use of some menu, other than the one we have employed. What we desire to emphasize is merely that care be taken to prevent the gaining of too much weight.

The normal increase of weight during pregnancy attributable to the product of conception amounts approximately to 12 pounds, distributed as follows: the fetus 7 pounds, the placenta 1½ pounds, the amniotic fluid 1½ pounds, the uterus 2 pounds. Inevitably, too, the mother's blood increases in quantity, her breasts enlarge and her tissues become more or less edematous; together these factors probably amount to 3 pounds. On this basis, pregnancy may be said normally to cause a total gain of approximately 15 pounds. If the gain be held to this point, the mother's body later, when the involution phenomena of the puerperium are completed, will return to its accustomed weight. In cases where there is a small gain, no gain at all, or an actual loss, it is certain that the mother's own tissues supply the fetus with more or less of the material normally provided by her food. On the other hand, if the gain during pregnancy be excessive it can mean only that the mother's body has increased its reserve, specifically fat, which not infrequently proves a source of dissatisfaction to the owner. This fact, fully appreciated by the laity, places in the hands of the obstetrician a potent argument which will influence his clientele to avoid gaining weight unnecessarily.

With only occasional exceptions the fluctuations of the weight during pregnancy have a definite trend and are productive of a characteristic curve. Typically, there is a drop of several pounds during the first two months which is followed by a period of stationary weight, or of slight increase, for two or three months more. Then, just about the time of quickening, a sense of well-being is experienced with hearty appetite and good digestion. Therefore, the last four to five months of pregnancy are attended with a rapid and consistent growth accurately reflected by the scales. The latter half of pregnancy is the time when excessive gains are likely to occur and watchfulness becomes indispensable. The appetite, as has been said, proves an untrustworthy guide. Neither will previous experience with a given

menu that served to keep the individual at a constant weight be useful, for during pregnancy the body handles food more economically. A diet adequate to meet precisely all the bodily needs and preserve the weight in equilibrium beforehand will not only be ample for the needs of pregnancy but will actually cause the gain just described as characteristic of the latter months.

In the directions given patients regarding their diet, after recommending a generous amount of water we find it helpful to stress the benefit of eating frequently and not taking a heavy meal at any time. For obvious reasons, we recommend the elimination from the diet of candy, cake, pastry, pie and other rich desserts. Milk may be taken at will in the early months and of course it proves indispensable in the latter months should a toxemia arise. But, for normal cases, during the period of notable growth, milk, as a beverage, is too fattening. Consequently, after quickening is experienced our patients are advised not to drink milk. As a routine for the latter half of pregnancy, the diet is arranged as follows:

Breakfast: Coffee or tea with toast and very little butter.
Mid-morning: A cereal with milk, no cream.
Luncheon: Bread with an egg, or soup, or salad.
Mid-afternoon: Orange juice, tea, or bouillon and crackers.
Dinner: One chop or the equivalent of some other meat; two vegetables, in moderate quantity and without a second helping; a simple dessert, preferably fruit.

The diet, just outlined, represents approximately 2000 calories and meets the physiologic requirements of the average patient. There are exceptional cases, of course, which benefit by different directions, but the underlying principle of having food frequently though always in small quantity has been adhered to consistently. As a matter of experience, we know the menu described contains ample vitamines and calcium, two dietary factors that now give the pediatrician some anxiety lest a defective antenatal régime become responsible for some of the nutritional disorders of infancy.

Now, as would be expected, uniform results have not been obtained. As far as possible, the diet has been made a constant factor but human frailty had to be contended with not infrequently, and none of the patients, we believe, would have succeeded in regulating the diet properly unless definite appointments had been given them for observing the weight, as well as other phenomena, and for the discussion of pertinent problems. Among the 500 consecutive cases studied a few individuals, already overweight, who accepted the opportunity to diet conscientiously, succeeded in avoiding any gain whatever during pregnancy; rarely they accomplished a slight loss. For the entire series the average gain in the mother's weight was 16½ pounds and the average weight of the infant 7¼ pounds.

The material collected may be analyzed from various standpoints, but for the present purpose, no criterion of classification seems more logical than the infant's weight at birth. On this basis six groups have been established. (1) The fetal weight was between 5 and 6 pounds in 34 cases. (2) Between 6 and 7 pounds in 132 cases. (3) Between 7 and 8 pounds in 205 cases. (4) Between 8 and 9 pounds in 107 cases. (5) Between 9 and 10 pounds in 19 cases. (6) Over 10 pounds in 3 cases. The heaviest baby weighed ten pounds, one-half ounce. There were two other members of the "over-10-pound-group" but these were cases of twins, in one of which the combined weights amounted to 12 pounds, 6 ounces and in the other to 12 pounds, 5 ounces.

WEIGHT OF INFANT	NUMBER OF CASES	PER CENT OF SERIES	AVERAGE GAIN OF MOTHER
5 to 6 pounds	34	6.8%	11 pounds
6 to 7 "	132	26.4%	14 "
7 to 8 "	205	41.0%	17 "
8 to 9 "	107	21.4%	10 "
9 to 10 "	19	3.8%	24 "
Over 10 "	3	0.6%	26 "

In roundly 90 per cent of the series (444 cases) the weight of the baby fell between 6 and 9 pounds. This incidence implies that scrawny babies, sometimes a bug-a-boo with faint-hearted converts to the principle of maternal diet-control, are rarely to be expected. Moreover, this view is confirmed by the fact that there was only a small group, namely 34 cases (6.8 per cent), in which the infant's weight fell below 6 pounds. On the other hand, and of greater practical moment, the effectiveness of recommending a restricted diet is exemplified by the number of cases in which the baby-weight exceeded 9 pounds; of these there were 20, or 3.8 per cent of the series. The infrequency of large babies, impressive as it is, requires a word of comment. In some instances the etiologic factor may have been a pregnancy prolonged somewhat beyond term; but ordinarily lax cooperation on the part of the patient was responsible, for reference to their records generally disclosed their admission that they were overeating.

As one would expect, there has been considerable variation in the weight gained by different individuals. In exceptional cases, as has been said, there was no gain at all or even a slight loss. Not a few patients were able to hold the gain at 15 pounds, estimated as the weight attributable to the pregnancy itself. But more often this ideal was exceeded, occasionally by as much as two or three times; and in one instance a gain of 54½ pounds in the mother was associated with a weight of 9¾ pounds on the part of the baby.

The relationship between the mother's gain and the baby's weight stands out clearly when the cases are tabulated. Thus, the average gain in the weight of the mother was as follows: 11 pounds, when the baby weighed from 5 to 6 pounds; 14 pounds, when the baby

weighed from 6 to 7; 17 pounds, when the baby weighed from 7 to 8; 18 pounds, when the baby weighed from 8 to 9; 24 pounds, when the baby weighed from 9 to 10; and 26 pounds, when the baby weighed over 10 pounds. In general, then, the weights of the babies at term parallel the gains of the mothers. Exceptions to the rule, however, are encountered. Our records include instances in which the baby has been large though the mother's gain was relatively small; on the other hand, an excessive gain in the mother has occasionally been associated with the birth of an infant of normal size.

"May the baby's weight be accurately regulated by the mother's diet?" To this question the answer is distinctly "No." Besides the quality and the quantity of the food the mother consumes, there are other nutritional factors in the problem, those, for example, pertaining to the utilization of food in the body. This does not signify that it is useless to employ the measures at hand merely because they are imperfect and fail to control the situation completely. Rather, it is advisable to stress the importance of diet-control during pregnancy, because this method represents the only one at command for influencing the size of the fetus.

To recapitulate, the review of this series of cases indicates that diet-control, often accepted hesitatingly and practiced imperfectly by the average patient, does not place in our hands a method of determining precisely what the size of the fetus shall be; but in general it does serve to prevent overgrowth of the fetus. This lessens the hazard of birth-injuries both to the mother and to the infant. Additional benefits, obviously relate to the prevention of maternal toxemias and also to a more satisfactory restoration of the mother's body to its accustomed weight prior to pregnancy. The average gain of the mother, 16½ pounds for the whole series, and the average birth-weight of the infant, 7¼ pounds, represent normal values. For this reason, we conclude that with a few exceptions our efforts to regulate the diet have been successful and that our patients have benefited through adherence to a régime which served toward maintaining the natural course of pregnancy.

819 Pacific Mutual Building.

LIVER EXTRACT IN THE TOXEMIAS OF PREGNANCY

Preliminary Report of Fifty Cases

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THE liver extract used in these observations was first prepared by Dr. Ralph H. Major[1] for use in cases of hypertension. The extract is practically free of histamine and produces no contractions in the uteri of virgin guinea pigs. Stoland[2] has found that liver extract per se does not produce uterine contractions. The drug has been shown by Major,[1] MacDonald[3] and James, Laughton and Macallum[4] to have a depressor action. In this series of cases we are led to think that it has in addition a detoxicating property in toxemias of pregnancy.

We first began this work by using the drug in cases of high blood pressure and the results in these cases suggested its use in toxemias of pregnancy with hypertension.

We have used the liver extract in a series of fifty cases. Seven were cases of eclampsia, which will be described later in this report and forty-three were cases of preeclamptic toxemia. We eliminated from this series nineteen cases (all living at present) presenting systolic pressures between 140 mm. and 145 mm. These presented additional symptoms, but lacked the symptom complex necessary to universally class them as true toxemias.

The cases reported represent consecutive cases treated at the Elizabeth Steel Magee Hospital, the University Maternity Dispensary and the Presbyterian Hospital of Pittsburgh, from October 1, 1926, to March 1, 1927.

In reviewing the literature of the past we find varying classifications of toxemias, none of which present clear cut lines of demarcation and for the present it would seem best to use the general term "toxemia" designating in addition the organ or organs bearing the brunt of the unknown toxin.

We have considered as evidence of toxemia the following findings, listed in the order of their importance.

1. Systolic blood pressure 145 mm. or above.
2. Albumin, casts or both in urine.
3. Headaches with sudden onset.
4. Epigastric pain.
5. Edema (of toxic origin).
6. Diminished urinary output.
7. Ocular symptoms.
8. Eyeground findings.
9. Nervous irritability.
10. Abnormal blood chemistry findings of little aid unless accompanied by symptoms.

In our total series, there were eleven cases of nephritis. Three gave definite known history of past nephritis and eight the kidney findings and history suggested a preconceptional nephritis. In this group results were not entirely satisfactory. The remaining (thirty-nine) cases responded promptly to the treatment with liver extract but remissions occurred whenever it was given in quantities below the neutralizing dose, suggesting to us the possible failure of the detoxicating function of the liver in this group. In these cases a drop in blood pressure always occurred, in some instances as much as 75 mm. in a few hours. In no case have we failed to keep the pressure down by the injections, given daily for a few days, then semiweekly and ultimately weekly.

The dose varied with the individual case. In the active eclamptic the extract was given intravenously in doses often of 20 c.c. every fifteen to thirty minutes depending on the drop in blood pressure and the state of coma of the individual. We have given as much as 185 c.c. in the first eighteen-hour period. In the mild or moderately severe cases intramuscular injections were used. No ill effects from the extract were noted.

Liver extract was the only drug used in the treatment of this series except where specifically mentioned in the report of the individual case.

We did not restrict diet or activities excepting in those who showed a blood pressure over 180 mm. In this class a partial or complete rest in bed was required; hot packs and hydrogogue catharties were not used. Liquid petrolatum was the only medication allowed for constipation.

The rapid abatement of the symptoms is noteworthy. Headaches, dizziness, spots before the eyes, epigastric pain, rapid pulse, nervousness and coma disappeared in the course of a few hours. The edema of the extremities and face disappeared in a few days and did not return as long as adequate dosage was given. The urinary output increased, the albumin decreased in amount and in some cases disappeared entirely. Casts usually disappeared before the albumin. Blood chemistry gradually improved.

Three cases with a definite past history of nephritis did not respond to treatment with liver extract. These cases were put on the routine salt-poor, low-protein diet with magnesium sulphate daily in addition to liver extract. No improvement occurred until after delivery. Their systolic blood pressures were 242 mm., 224 mm., and 196 mm., respectively. The eyegrounds in these cases showed definite albuminuric retinitis; the urine contained large quantities of albumin and casts. The blood nonprotein nitrogen was above normal. The other eight suspected nephritic cases responded only fairly well, blood pressures showed moderate improvement and albumin diminished slightly.

Other symptoms as headache, dizziness, ocular symptoms and edema disappeared.

The eyegrounds were examined by Dr. W. W. Blair. Positive findings were present in the nephritic cases mentioned above. Where beginning edema of the fundi occurred, the results were delayed. Where albuminuric retinitis was present no improvement was seen. Normal fundi were found in the nonnephritis cases, and here the results were rapid and uniformly good.

Blood chemistry, while routinely made, and in most cases repeated, has not as yet furnished us with an index as to the severity of the condition, nor has it enabled us to predict the rapidity of improvement.

In the past we accepted certain evidence of toxemia as an indication for the induction of labor or even cesarean section. The present consecutive series are all continuing their pregnancies, free from toxic symptoms and with normal blood pressures or have gone into labor spontaneously and have been delivered.

CASE 1.—Mrs. O. S., a negress, aged 19, para ii, gestation forty weeks, entered the Magee Hospital, December 28, 1926. At the prenatal visits the systolic pressure did not exceed 124 mm. The urine was negative for casts and albumin. No toxic symptoms were present. On admission to the hospital patient complained of a violent headache, epigastric pain, and pain over the uterus. On inspection patient seemed lethargic and listless. There was very slight edema present over face, hands and lower extremities. The blood pressure was 186/134 mm., pulse 120, temperature 99.4° F. The eyegrounds were negative. At 8 A.M. the patient had a typical eclamptic convulsion lasting five minutes; 10 c.c. of liver extract were given intravenously and repeated every half hour for nine doses. There were three typical eclamptic convulsions at intervals of thirty to forty minutes. The blood pressure dropped to 144/108 mm. The patient was perfectly rational five hours after the first convulsion with a corresponding improvement in all other symptoms.

This patient had a partial premature separation of the placenta and the fetus was stillborn, birth occurring spontaneously four hours after the first convulsion. The urine became albumin- and cast-free within one week and the blood pressure remained around 120 mm. No treatment except liver extract was used in this case.

CASE 2.—Mrs. E. J., a negress, aged 16, primipara, gestation thirty-six weeks, entered Magee Hospital January 6, 1927 at 8 A.M. with a history of awakening at 3 A.M. with a terrific headache followed immediately by convulsions. Her mother stated she had between fifteen and twenty convulsions before admission. On admission the patient was in semicomatose delirious state with slight edema of the lower extremities, blood pressure 168/90 mm., pulse 140, temperature 102.2°. The bladder contained ten ounces of turbid urine, with six grams of albumin and a moderate amount of casts. The patient had three convulsions after admission. A total of 85 c.c. of liver extract were given intravenously in 10 c.c. and 15 c.c. doses at half-hour intervals between 9 A.M. and 2 P.M. Patient became conscious, output of urine increased to two ounces per hour and the symptoms seemed to have cleared up. The blood pressure dropped to 138/84 mm., free of symptoms until 8 P.M. when the blood pressure rose to 166/90 mm. and the patient had another convulsion. Then 20 c.c. of the extract were given intravenously, the blood pressure dropped to 148/90 mm., no more convulsions occurred.

On January 7, 1927 patient was delivered spontaneously at 4 A.M., the fetus dying twenty-four hours later in convulsions (autopsy showed nothing of note in

liver, brain, etc.). Patient seemed to be rather irrational at times and finally developed a toxic psychosis. When she left the hospital the urine was free of albumin and casts and the blood pressure within normal limits.

This was the second eclamptic treated and we now feel it would have been well to have continued active treatment and if possible prevented the recurrent convulsion.

CASE 3.—Mrs. W. W., white, primipara, aged 28, gestation twenty-six weeks, entered the Presbyterian Hospital January 9, 1927, 9 P.M. in deep coma. Patient had complained of intense headache and epigastric pain on morning of admittance, first convulsion occurred at her home at 3 P.M. followed by three more. She was then sent to the hospital by her physician and had one convulsion in the ambulance, and another on admission. The eyegrounds were negative. Patient had not voided for twelve hours previous to admission and bladder contained 240 c.c. of reddish black urine, containing sixteen grams of albumin and there was a large quantity of red blood cells and casts present. Slight edema of the hands, face and lower extremities was present. Pulse irregular and around 140, blood pressure 196/130 mm., respirations of Cheyne-Stokes type and cyanosis was present. Twenty c.c. of the extract were given intravenously and 10 c.c. every fifteen to thirty minutes thereafter, a total of 135 c.c. in twelve hours. The patient's mind cleared up six hours after treatment was started. The kidney secretion rose to a total of 2430 c.c. during the first twenty-four hours in the hospital. Fluids were taken by mouth and her condition greatly improved; blood pressure dropped to 128/74 mm. within twelve hours; urine became negative for albumin and casts eight days after treatment was started, blood pressure remaining around 120/70 mm.

Fetal life continued for eighteen days after which heart sounds were not heard and she was delivered of a macerated fetus February 12, 1927. Less than one-third of the placenta was functioning, the remaining portion having been occluded by infarcts.

CASE 4.—Mrs. W. F., a white primipara, aged 21, gestation thirty-eight weeks, entered Magee Hospital January 24, 1927 in labor. Patient first appeared at Clinic on January 19, 1927 with a blood pressure of 132/90 mm. when urine was free of casts and albumin. The patient was delivered spontaneously after a seven hour and fifty minute labor, January 25. In the afternoon she developed an intense headache, but did not report it until after her sight became blurred. Blood pressure at this time was 196/98 mm. Fifteen c.c. of liver extract were given intravenously. Blood pressure then dropped to 124/76 mm., but forty-five minutes later she had a typical eclamptic convulsion. The urine contained four grams of albumin and many granular casts, pulse 144, temperature 100.4°. The blood pressure during the next twenty-four hours varied from 104/48 mm. to 130/74 mm., it being controlled by 185 c.c. of the extract during that period, given intravenously in 10 c.c. to 20 cc. doses. The patient had eighteen typical eclamptic convulsions, the last occurring January 26. Patient began to take fluids by mouth two hours later and during the next twenty-four hours 6400 c.c. of water were taken with an output of 6325 c.c. The blood pressure remained around 128/70 mm. On January 26th at 9 A.M. and 6 P.M., morphine sulphate gr. ¼ was given.

CASE 5.—A para i, aged 21, gestation thirty-eight weeks. At prenatal clinic patient was symptomless, blood pressure not exceeding 118/76 mm. Urine was free of albumin and casts. Entered hospital February 15, 1927 in labor, complaining of headache. Just before delivery of head, patient had an eclamptic convulsion; blood pressure was 142/106 mm. Half hour later blood pressure was 168/104 mm. Second convulsion occurred, an initial dose of 20 c.c. liver extract was given intravenously. Two more convulsions occurred at intervals of thirty minutes. Intravenous injections of 10 c.c. to 15 c.c. were given every fifteen to thirty minutes

until blood pressure and symptoms improved. Intervals of injections then increased. A total of 115 c.c. used during the first twelve hour period. The urine contained eight grams of albumin, casts and red blood cells. The eyegrounds were negative, temperature after first convulsion 101°, pulse 122. The blood pressure dropped to around 132/80 mm., consciousness was regained in four hours, urine contained less albumin and in ten days was free of casts and contained only a trace of albumin.

CASE 6.—Para v, aged 27, gestation forty weeks or more, entered Magee Hospital February 18, 1927. During prenatal care she presented no toxic symptoms, blood pressure did not exceed 115/68 mm. and urine was free of albumin and casts. Entered the hospital, having carried the fetus beyond the expected date of delivery, with edema of feet, blood pressure 134/74 mm., no other symptoms. February 24 (six days later), patient reported she had a severe headache and slight epigastric pain all night. At 7:30 A.M. she had an eclamptic convulsion. Blood pressure then was 158/120 mm. While taking blood chemistry another convulsion occurred. Twenty c.c. of liver extract were given. The blood pressure dropped to 128/110 mm., after which it varied from 110 mm. to 128 mm. During the twenty-four hours following the first convulsion a total of 115 c.c. liver extract were given in divided doses. Patient went into labor the following day and was delivered of a living child weighing 5040 grams, low forceps being necessary, no anesthetic. Urine contained six grams of albumin, casts and red blood cells. Four days later the urine was free of casts and contained only a trace of albumin. Temperature 99°, pulse 100, eyegrounds negative during convulsions. Morphine sulphate gr. ¼ given immediately after the first convulsion.

CASE 7.—Mrs. E. P., white primipara, aged 18, gestation thirty-eight weeks. On February 20, 1927 patient presented generalized edema, dyspnea, blood pressure 174/106 mm., pulse 120, temperature 98.4°, aortic and mitral insufficiency with cardiac decompensation recorded. Symptoms became more pronounced the following two days and at 10:15 P.M. February 22 a convulsion was recorded. Blood pressure 198/0 mm. at 2:20 A.M., February 23rd. Morphine sulphate gr. ¼ was given, the membranes were ruptured by the attending physician to induce labor and patient was delivered under ether anesthesia, by low forceps, at 10:18 A.M., February 23. Urine during this time boiled solid with albumin and contained casts. After delivery blood pressure was 126/0 mm. and she presented a picture of shock. February 24 patient was delirious, blood pressure 188/58 mm., urinary output for preceding twenty-four hours 700 c.c., edema increasing, patient in a mild semicomatose condition. February 25 a convulsion occurred at 10:20 A.M. Patient sunk into a deep coma, blood pressure above 300/0 mm., axillary temperature 105.6°, pulse 140, Cheyne-Stokes respiration. One hour and forty-five minutes later without treatment blood pressure dropped to 114/0 mm. February 25 at 1:30 P.M. we saw patient for *first* time and expressed the opinion she was in a moribund condition and hopeless regardless of the treatment used. We did, however, give her 30 c.c. of liver extract and blood pressure remained around 80 mm. until death at 5:30 P.M. the same day.

SUMMARY

1. Cases of known or suspected preconceptional nephritis were only symptomatically improved after using liver extract.

2. Convulsions did not occur in any treated preeclamptic cases.

3. Improvement always occurred except in the preconceptional nephritic cases.

4. No mortality in this consecutive series except Case No. 7.

5. Eclamptics must be under constant observation and the drug given in doses sufficient to neutralize the toxin present in the individual.

This preliminary report is made with the view of calling this treatment to the attention of our fellow workers, hoping thereby to stimulate the early use of the extract in a large number of cases and permitting an ultimate appraisement of its value.

R. H. Major and J. M. Singleton of the University of Kansas, reported to us that they had used liver extract in three cases of toxemia of pregnancy before we started our work.

We wish to gratefully acknowledge the full cooperation and assistance of Dr. W. W. Blair, Ophthalmologist, Drs. M. Cohen and Arthur Thomas of the Pathological Department, and the house staff of the Magee Hospital as well as the hospital management.

Eli Lilly & Company, Indianapolis, have furnished us with their product of liver extract (Heparmone) for use in this series in quantities and at such times as requested. For this cooperation we are greatly indebted.

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121 UNIVERSITY PLACE.

VAGINAL STERILIZATION, WITH OR WITHOUT VAGINAL HYSTEROTOMY

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THE welfare of certain patients requires that they should not be subjected to the perils of future pregnancies. Such women are those suffering from nephritis, cardiac disease where compensation previously has failed, and active pulmonary tuberculosis. If these individuals should come under observation when an early pregnancy is in progress it is equally advisable that their uteri should be emptied at the same time that sterilization is effected.

The method heretofore employed in our clinic and by many American operators has been to open the abdomen, incise the uterus, evac-

Fig. 1.—The labia minora, if redundant, are sutured to the skin, thus keeping them out of the way. The anterior vaginal wall is opened by the conventional inverted T incision used in vaginal cesarean section.

Fig. 2.—The two triangular flaps of vaginal wall formed by the inverted T incision are now reflected outward exposing the bladder.

Fig. 3.—The bladder has been separated from the lower uterine segment by scissors and gauze dissection and is held up out of the way by a long bladed vaginal retractor. The uterovesical fold of peritoneum has been identified and opened by a transverse incision, exposing the lower portion of the anterior surface of the uterus which has been grasped with a double tenaculum forceps.

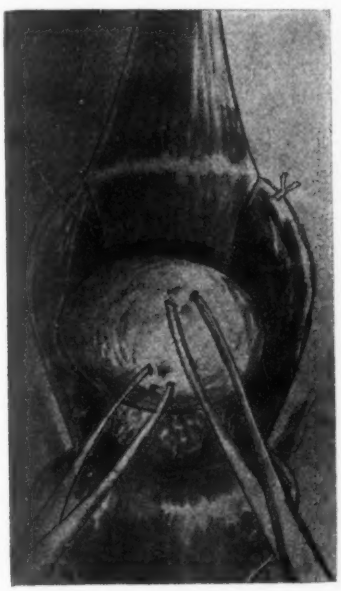

Fig. 4.—The French hooks previously applied to the anterior lip of the cervix have been removed and the cervix replaced in the depths of the vagina so that the fundus of the uterus may be drawn forward through the peritoneal incision. The fundus of the uterus is delivered by traction on the tenaculum forceps, which are placed one above the other in successive bites as more and more of the uterus appears in view.

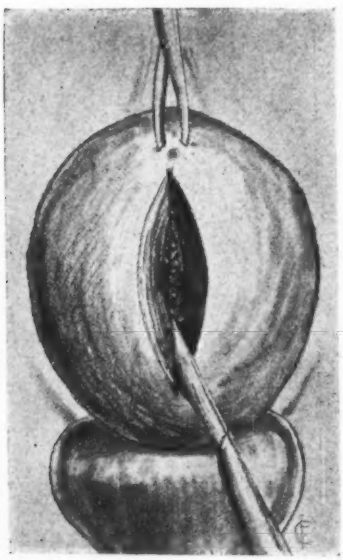

Fig. 5.

Fig. 6.

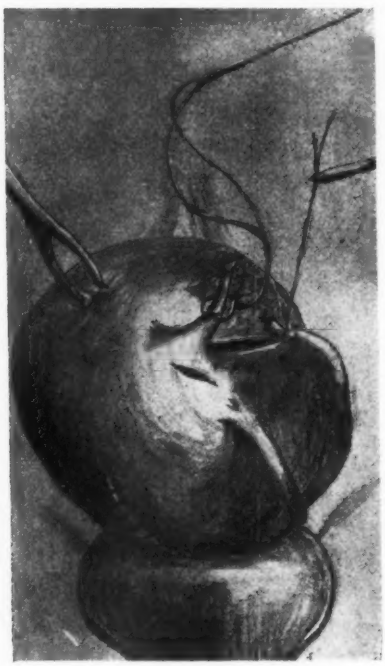

Fig. 7.

Fig. 5.—The anterior surface of the uterus is incised longitudinally and the ovum removed either by the finger or by a large blunt curette.*

Fig. 6.—The uterine incision is now closed in layers with chromic catgut. The deepest layer is continuous, the next, which embraces the bulk of the muscularis, interrupted, and the final, or peritoneal, stitch is of the overlapping continuous variety.

Fig. 7.—The operator now proceeds to sterilize the patient by the method I have devised for the abdominal route. One cornu of the uterus is drawn into view. Both tube and round ligament are identified. The tube is doubly ligated with chromic catgut about 1½ inches from its uterine insertion and divided between the ligatures. The proximal end is dissected free from its mesosalpinx with a sharp knife, keeping close to the tube to avoid bleeding. The loop of a double suture armed with either a straight or a round needle is slipped over the free proximal end of the tube. The tube is now transfixed with the needle proximal to the loop, thus forming a slip noose. A small incision is made anteriorly in the uterine serosa at the base of the tube.

*Incision of the anterior wall of the uterus above the cervix may be carried out readily as late as the end of the third month of pregnancy. Beyond this date the uterus is best emptied by the classical vaginal cesarean section before proceeding to sterilization. According to Kakuschkin the advantage of the supracervical section is that the integrity of the cervix is not destroyed and healing is therefore more satisfactory.

uate its contents, suture it and sterilize the patient by some operation upon the tubes. This procedure is not technically difficult but it carries with it the disadvantages inherent in all laparotomies.

It has seemed to me that with multiparae in whom the pelvic supports were well relaxed, the same results could be obtained by operating through the vagina provided that pregnancy had not advanced far enough to make the operation unduly difficult. The advantage to be thus derived lies in an increased smoothness of

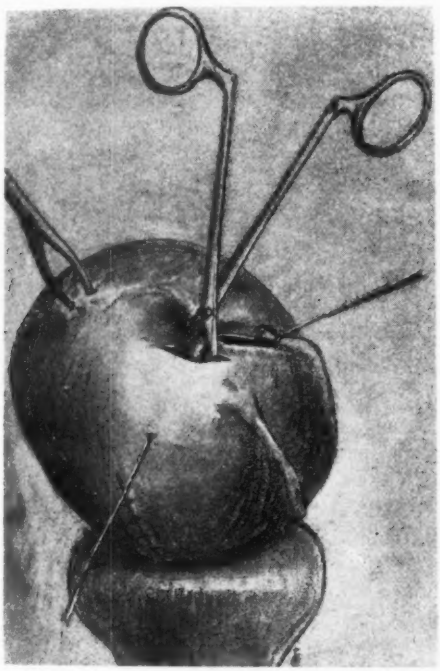

Fig. 8.—A pocket is made in the uterine muscularis by spreading a pointed hemostat. The needle carrying the double suture to which the tube has been attached by the slip noose is passed through the pocket and brought out on the surface of the uterus about an inch distant.

By spreading the mouth of the pocket with the hemostat and by traction on the double suture the proximal end of the tube is buried in the uterine muscularis.

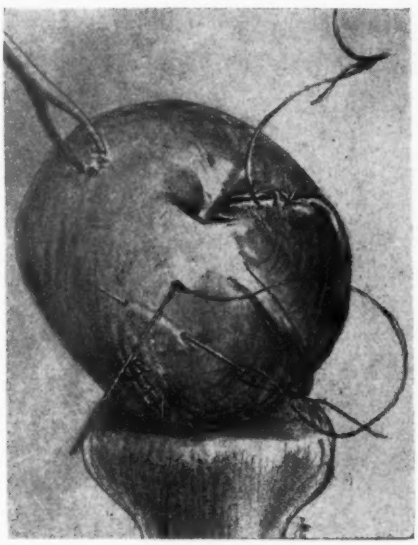

Fig. 9.—One strand of the double suture is cut and the needle which now carries the other strand is passed through the uterine surface at right angles to the direction of the double suture. The two ends of the double suture are now tied, thus anchoring the end of the tube in the pocket.

The cut end of the distal portion of the tube may be buried in the mesosalpinx with a running suture or it may be left unburied if this part of the operation presents any difficulty.

convalescence. The same absence of pain, vomiting and distention that one expects after the Watkins-Wertheim interposition operation has characterized the recoveries of the four patients upon whom the writer has recently operated by this method. On the other hand, there is no doubt that the vaginal method is more difficult than the

abdominal, although this should not be a valid objection to a competent operator if thereby the patient's comfort is increased.

The essentials for the operation are:

1. The patient should be a multipara in whom the pelvic supports are well relaxed.

2. The uterus should be freely movable and easily drawn down. A previous suspension or fixation or the presence of adhesions limiting the mobility of the uterus are contraindications.

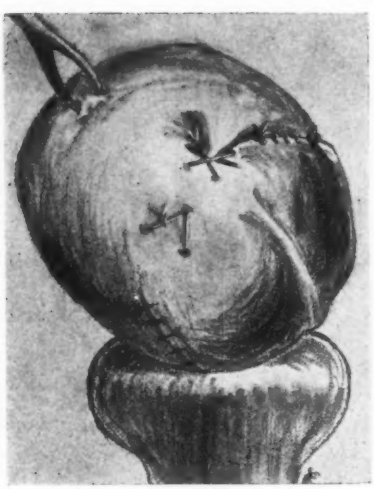

Fig. 10.—The mouth of the pocket is closed with a figure-of-eight suture. The other cornu is drawn into view and the same procedure repeated on the other tube.

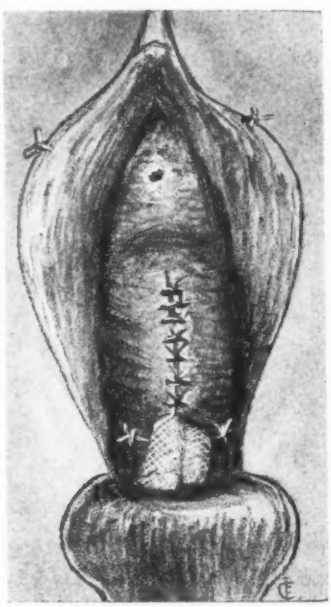

Fig. 11.—The portion of the uterus that has been delivered is returned to the peritoneal cavity. The incision in the uterovesical fold is not sutured as its closure is likely to prevent the escape of blood from the sites of operation on the uterus. A drain is placed to the uterus through the peritoneal opening to prevent the formation of a hematoma and is removed at the end of forty-eight hours if conditions are satisfactory. A cigarette wick is more easily removed than one of gauze alone. The vaginal incisions are closed to the drain with interrupted sutures.

3. If the patient is pregnant she should not have passed the fourth month of gestation. I have emptied by classical anterior vaginal hysterotomy the uterus of a woman who was five months pregnant and sterilized her with considerable difficulty *per vaginam*. In my opinion patients who have passed the fourth month are best operated on abdominally.

In all four cases sterilization was effected by doubly ligating the tubes and burying their proximal ends in the uterine musculature according to the method I devised and now employed in the Boston Lying-in Hospital for abdominal sterilization. One patient was assumed not to be pregnant, but her uterus was curetted as a precautionary measure and she was sterilized by vagina. Another was five months pregnant. Her uterus was emptied by vaginal cesarean section as noted above and sterilization done by vagina. The other two were two and three months pregnant. Their uteri were partially delivered after section of the uterovesical fold of peritoneum and were emptied by longitudinal incision of the anterior surface above the cervix as advocated by Kakuschkin.

The indication for operation in all four cases was chronic nephritis.

One operation was done under gas-oxygen-ether; the other three under a combination of pantopon-scopolamine and sacral anesthesia with gas-oxygen when needed. The convalescences of all were normal and notably comfortable and the patients were allowed up on the tenth day.

The legends accompanying the illustrations give the steps of the operation in detail.

475 COMMONWEALTH AVENUE.

CARCINOMA OF THE CERVIX IN A THIRTEEN-YEAR-OLD PATIENT

BY ADOLPH BONNER, M.D., BROOKLYN, N. Y.
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CARCINOMA of the cervix in women under twenty years of age is extremely rare. Practically all such cases reported in the literature were diagnosed when the disease was well advanced. In the writer's opinion, the term "cancer age" and all that it conveys to the medical mind, is of inestimable value, if not interpreted too literally. The possibility of cervical carcinoma occurring in the first two decades of life should be borne in mind. The following case is reported because of the youth of the patient, there being only two authentic cases of cervical carcinoma reported in individuals younger than thirteen. Of secondary interest is the fact that the patient is a Jewess, it having been observed frequently in the literature that cervical carcinoma is relatively uncommon in Jewish women of all ages.

R. M., age 13, American Jewess, school girl. Her family history was irrelevant. She had measles and diphtheria in childhood. A tonsillectomy was performed at the age of six. In April, 1921, when nine years old, she was treated in the out-patient department of a New York hospital for "itching in the rectum," and difficulty in

starting the urinary flow. The diagnosis of "vulvitis traumatic" was made and the last progress note reported her condition improved. No history of trauma was obtainable. The patient states, however, that she has had more or less indefinite symptoms of rectal itching and bladder disturbances for several years.

Her first menstruation occurred in August, 1923, at the age of eleven; was scanty and of one day's duration. Her next period was two months later, moderate flow, lasting eight days. Thereafter the periods occurred every ten to fourteen days, moderate in amount and associated with mild cramp-like pains in the left lower quadrant, these pains occurring on the second day of menstruation and lasting for a few hours. About November, 1924, a thick cream-colored foul vaginal discharge appeared, of sufficient profusion to necessitate the constant wearing of a napkin. This leucorrhea continued up to the time the patient presented herself at my office. In January, 1925, she had a profuse vaginal hemorrhage causing her to faint. The vaginal bleeding continued for two weeks, during which time the

Fig. 1.—Low power. Showing atypical gland structures and irregular distribution of cells in the cervical musculature. (x 60.)

patient was in bed. After an interval of three weeks, a repetition of the profuse bleeding occurred and lasted for two and one-half weeks. This sequence of events was repeated, the "hemorrhages" ceasing spontaneously on each occasion. About March, 1925, she was given two deep roentgen exposures, with an interval of nine days, the exposures being directed over her spleen and flat bones. This did not influence the course of the bleeding. Shortly after this, in April, 1925, she was admitted to a hospital where she was given two blood transfusions of 250 c.c. each, and was discharged twelve days after admission with the diagnosis "ovarian dyscrasia." Her hemoglobin, at this institution, was recorded as 50 per cent on admission, and 75 per cent following her second transfusion. A vaginal examination was not made.

The patient was admitted to the Jewish Hospital on June 9, 1925, about one

month after her discharge from the other institution, her bleeding having continued unchecked. Bleeding was the chief complaint on admission.

Physical examination showed a well nourished, well developed girl, obviously anemic. She was mentally bright. Her general physical examination was essentially negative. Rectally, the cervix was definitely enlarged. The hymen was intact, but permitted introduction of the examining finger. A soft rounded mass was felt in place of the cervix, the size of a small orange, and occupying the entire vaginal vault. Inspection of this mass through a virgin speculum, showed a cauliflower type of growth, entirely replacing the cervix, pale in color, and giving the impression of a degenerating polyp. At one point there was an ulcerated area one centimeter in diameter. The growth was free of the vaginal wall, and the examining finger could be passed freely around it. The vaginal wall at the vault was slightly indurated, and yellowish gray in color. The uterus was not definitely outlined. No masses were felt abdominally.

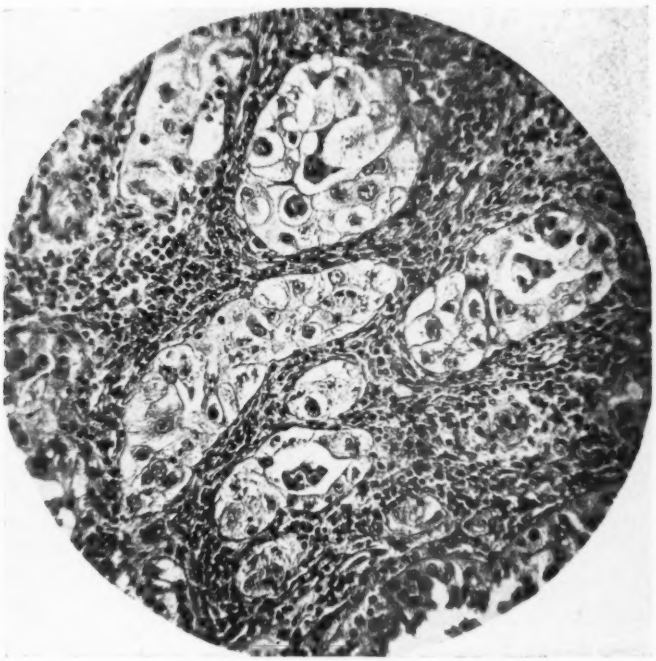

Fig 2.—High power. Showing the irregular cuboidal and polygonal cell outlines, granular cytoplasm and eccentric nuclei in various phases of mitotic activity. Many plasma and round cells are seen in the stroma. (x 350.)

Blood pressure 108/60. Blood Wassermann negative. Urine negative. Hemoglobin 42 per cent (Dare). RBC 2600000. WBC 9600 with 72 per cent polymorphonuclears. Bleeding time two and one-half minutes. Coagulation time seven minutes. X-ray examinations of the bones and lungs were negative.

She was given a transfusion of 300 c.c. of whole blood before going to the operating room, June 17, 1925. Under gas and oxygen anesthesia, a cautery excision of the growth was performed, the entire infravaginal cervix being removed; 25 millicuries of Radon (radium emanations), were inserted into the uterine cavity, and 5 Radon "seeds," one-half millicurie each, were buried at equidistant points in the cervical stump. The 25 millicurie Radon capsule was removed at the end of forty-five hours.

The patient made an uneventful convalescence and was discharged in ten days. At this writing it is nineteen months since her operation and two years since the onset of her symptoms. The cervical stump is well healed, freely movable and no masses are felt. The patient has gained in weight and her metrorrhagia as well as her menstrual function has not reappeared. Following her operation Dr. Milton Wasch has continued to give her x-ray therapy.

Pathologic Report by Dr. Lederer: Specimen consists of a portion of the cervix and several pieces of tissue. Gross: Several small pieces of tissue measuring 1 to 2 cm. in size, present a similar appearance. The consistency is soft and very friable, and they are of a grayish-red color, being apparently papillomatous masses. *Microscopic*: Under low magnification (Fig. 1), the mass is seen to be composed of an abundant stroma in which there are scattered numerous gland-like structures.

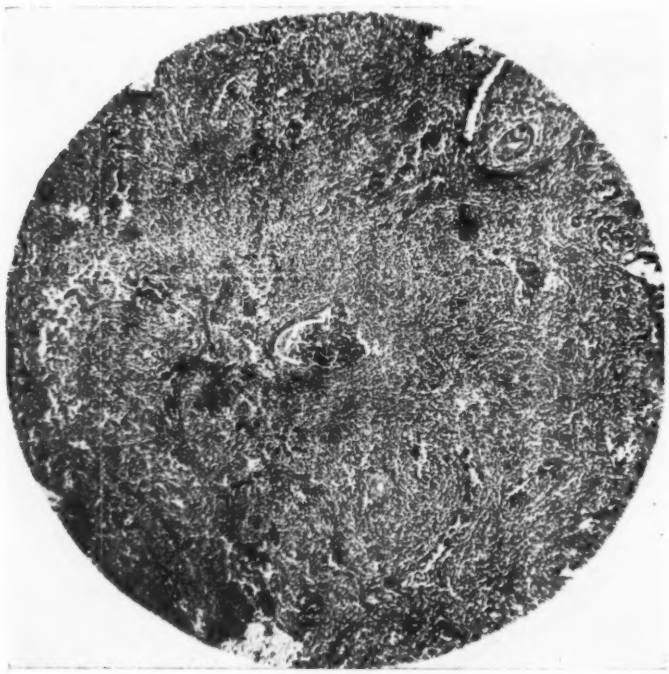

Fig. 3.—Low power. Showing area of cervix nearer to fundus less extensively involved. In the lymphatic spaces are seen islands of epithelial cells similar to those in Figs. 1 and 2 but more compactly arranged. (x 60.)

In some places the stroma is relatively less, due to the presence of a diffuse distribution of cells, similar to those which make up the tubules. Under high magnification (Fig. 2), the cells composing the tubular structures are cuboidal and polygonal in shape. They vary in size considerably. The protoplasm is granular and the nucleus occupies an eccentric position. Many evidences, including mitosis, of active cell proliferation are present. The appearance of these cells and their arrangement stamps them as being unquestionably epithelial in type. The stroma is composed of a compact fibrous tissue which contains a very large number of plasma and round cells, (Fig. 2). *Cervix, Gross:* Cervical tissue, firm in consistency, pinkish in color, presents a lobulated appearance. *Microscopic:* (Fig. 3), Normal except for the presence in the lymphatics of numerous islands of tissue similar to those described above. The arrangement, however, is more compact, and is probably

due to the histologic structure of the cervical tissue. In some areas there is a pronounced plasma cell reaction.

Diagnosis: Papillary adenocarcinoma of the cervix.

Because of the rarity of carcinoma of the cervix at this age, the sections were submitted to Doctors Elise S. L'Esperance and James Ewing, who corroborated the diagnosis of adenocarcinoma.

A careful search of the literature for cervical carcinoma in the young, revealed but two authentic cases reported in subjects younger than thirteen.

Ganghofer[10] in 1888, reported a case in a girl eight years old. Although the pathologic diagnosis has been questioned by later writers, it was probably a genuine case of carcinoma. The histologic diagnosis was corroborated by Professor Chiari of Prague.

Glöckner[14] in 1908, reported a case in a girl of seven, the diagnosis in this instance being confirmed by Robert Meyer and Carl Ruge. This was a case of adenocarcinoma.

Engelhorn[8] mentions Rosenstein's case in a child of two, and the report of this case bears the statement that the preparation of the specimen did not permit of a definite interpretation, but it was most probably a case of carcinosarcoma of the cervix. According to Engelhorn, Ganghofer's case is the youngest positive one proved by microscopic diagnosis. Engelhorn mentions Ripem, who reported a case of endothelioma of the cervix in a girl of thirteen from Halle's Frauenklinik, the youngest case of malignancy in his series. Fränkel's case of carcinoma of the cervix in a girl of nineteen, microscopically diagnosed by Eckhardt, and Schauta's case of malignant adenoma of the cervix in a girl of seventeen, are also cited by Engelhorn. Glatter's case aged seventeen and Beigel's case aged nineteen do not present enough evidence to both Engelhorn and Schauta, to be classified as true carcinoma cases.

Adams[1] in 1915, reported a case of glandular carcinoma of the uterus in a child aged two and one-half years. The pathologic committee of the Royal Society of Medicine, however, reporting on this specimen, called the growth a teratoma, not a carcinoma.

Cragin[5] and DeRouville[20] both reported cases of cervical carcinoma in eighteen-year-old patients. Cragin's case was confirmed microscopically by Francis Carter Wood. Peterson[18] mentions Wells' case of adenocarcinoma at the level of the internal os in a married woman of eighteen. Peterson also cites his own case of carcinoma of the cervix in a married woman of twenty-one and six others between twenty and twenty-five years of age in a series of five hundred cases of uterine carcinoma.

Eckhardt[7] in 1887, reported a case of cervix carcinoma in a nineteen-year-old woman.

Tschopp[21] in 1897, reported a case of body carcinoma in a patient nineteen years old.

Gayraud[11] up to 1911, had found three cases of uterine carcinoma in the first twenty years of life, those of Eckhardt, Tschopp, and Ganghofer, which are cited above. Of these, Peterson says, "It is questionable if these cases are not in reality teratoma or sarcoma, not carcinoma."

Webster[22] gives Gusserow's statistics. In 3471 cases, the latter found two cases below the age of twenty, one at seventeen, the other at nineteen. He had 114 cases between the ages of twenty and thirty.

Koblanck[16] in a larger series numbering 6354 cases, found only the two cases mentioned by Gusserow below the age of twenty.

Little[17] in 1896, reported a case of carcinoma of the cervix in a girl of fourteen. No histologic examination of the specimen was made here.

Darnall[6] in 1920, reported a case of adenocarcinoma of the cervix in an unmarried colored girl of twenty who gave no history of any pregnancy or miscarriage.

Gibson[13] in 1920, reported six cases in women between twenty-five and twenty-nine years of age, five of whom were married.

Bland-Sutton[3] has seen cases in women of twenty-three, twenty-five and twenty-six.

Bland[2] has had two cases at twenty-three, and several between twenty-four and twenty-seven years of age.

Forsdike[9] in 1921, reported a case of adenocarcinoma of the cervix in a virgin aged twenty-four.

Gérin-Lajoie[12] in 1923, reported a case of epithelioma of the cervix in a nullipara of twenty-three. This patient also had a two-plus Wassermann.

Hammond[15] states that 3 to 4 per cent of cases of carcinoma of the uterus occur in nulliparous women. In 1922, he reported nine cases in nulliparous women, ages ranging from twenty-nine to sixty, three being single. Weir in 1900 reported a case of adenocarcinoma of the cervix in a nullipara aged twenty-eight and McKendrick in 1907 reported a case of epithelioma of the cervix in a single woman aged fifty-seven.

Brown[4] in 1920, reported a case of squamous-cell carcinoma in a primipara aged twenty-four, developed during pregnancy, and who was delivered of a healthy child.

SUMMARY

1. A case of undoubted adenocarcinoma of the cervix in a thirteen-year-old girl is the third case below the age of fourteen recorded in the available literature.

2. Carcinoma of the cervix below the age of twenty is extremely rare.

3. Cervical carcinoma is not rare between twenty and thirty and the danger of employing the expression "cancer age" literally is obvious.

4. There are many cases of carcinoma of the cervix reported in nulliparous women.

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435 Grand Avenue.

THE COMMON CAUSES AND THE PREVENTION OF REACTIONS FOLLOWING INTRAVENOUS INJECTIONS OF GLUCOSE (DEXTROSE) SOLUTION*

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IN OBSTETRICS as well as in medicine and surgery the intravenous administration of glucose solution has now attained considerable importance as a rational therapeutic measure for a number of conditions. For this reason a discussion of the reactions which occasionally follow such injections should be of general rather than merely obstetric interest even though it is in the latter field that this treatment is most frequently employed.

The usefulness of such injections in various acute intoxications is now well established. Litchfield[1] was one of the first to advocate this procedure in certain medical conditions, notably pneumonia, and it was this suggestion of his which led one of us (Titus) to utilize and develop this method of treatment for pernicious vomiting and other toxemias of pregnancy. These results have been published from time to time[2] and do not enter into this discussion more than to introduce the comment that others have successfully followed the treatment until the value of the general principles involved has become an accepted fact.

The application of this treatment to general surgery has developed apace, and now there is nothing which relieves postoperative vomiting and acidosis as quickly and effectively as a few intravenous injections of glucose solution. Polak[3] recommends it as a prophylactic measure before beginning cesarean section; it is particularly valuable as a preliminary to prostatectomy and cholecystectomy; and we have now come to the point of giving routinely an intravenous injection of glucose solution immediately after every major obstetric or gynecologic operation as a preventive of shock and distension, nausea and acidosis. It is also especially useful supportive treatment in the vomiting and dehydration of peritonitis.

Much as the treatment is used, physicians would probably utilize it far more frequently if it were not for the reactions which occasionally follow such injections. These reactions manifest themselves by a sharp chill, usually considerable rise in temperature with shock and collapse which may be mild or may be serious. Exceptionally a death has been reported.

*Read before the Pittsburgh Academy of Medicine, March 31st, 1926.

During the several years that first one and then both of us were developing and using this treatment for pregnancy toxemias there has been the opportunity to give or supervise an untold number, running into many hundreds, of such injections. Without hesitation the bald statement may be made that reactions are almost invariably due to faulty technic either in the preparation of the glucose solution or the method of its administration. Consequently reactions should be largely preventable. The few that have been seen in our service were mild and probably all could have been avoided, despite the fact that it was necessary gradually to develop both the dosage and the technic of administration in pregnancy toxemias since this was work which had not been done before.

It soon appeared that there were a few definite rules to follow, and while these have been generalized in our previous works they may be outlined as follows:

1. *Dosage.*—The average dose for an adult is about one gram per kg. of body weight. An average adult weighs between 50 and 75 kg. so that it was decided to establish 75 gm. as the initial dose, subsequent doses to be 50 gm. There will be some spill through the kidneys, but the appearance of sugar in the urine following such an injection is of no especial significance. This loss is lessened the more slowly the injection is given. To give less than a therapeutic dose is a common mistake and accounts for some disappointments with the treatment.

2. *Glucose (Dextrose).*—The glucose should be chemically pure. In our service this has been insisted upon from the time of the first publication in 1920. Several different preparations have been used and while there is little choice if chemically pure we have usually used Merck's c.p. anhydrous glucose. This firm markets also a grade of glucose for which no claim of chemical purity is made, but which is issued in the same type of bottle with a label similar to the "e.p." grade, bearing the words "Pure Glucose." Because of the resemblance of the two products the one may easily be confused for the other, but only the chemically pure should be used for intravenous administration. This similarity in the packages is unfortunate.

3. *Solvent.*—The glucose should be dissolved in *freshly* double distilled, uncontaminated water, and not in salt solution or sodium bicarbonate solution as has been variously recommended. In the preparation of a single dose, 50 gm. of the glucose is carefully weighed and then dissolved in 200 c.c. of freshly distilled water, using only glassware which has been thoroughly washed in distilled water. Before preparing for sterilization the solution should be filtered at least five or six times to remove even tiny particles of dust or cotton fibers. For the sake of simplicity in making any necessary calculations for dilutions it is convenient to have each flask contain 25 gm. of glucose in 100 c.c. of water (25 per cent), or a "half-dose."

The recent work of Seibert[4] followed by that of Bourne and Seibert[5] has developed the interesting fact that the cause of many febrile reactions following intravenous injections of various solutions is to be found in bacterial contamination of distilled water. The "pyrogen" is apparently a nitrogenous product of the contaminating bacteria, and even though the latter are destroyed by sterilization of the water or the solution made from this water, the "pyrogen" is unaffected and will cause sharp reactions in a large percentage of instances. Their study of this subject has been rounded out by a series of experimental reactions

on laboratory animals, and it is probable that their investigations will account for the majority of hitherto unexplained reactions following the intravenous injection of different solutions.

It is essential, therefore, that freshly double-distilled water be used as the solvent of laboratory-made glucose preparations, and as the diluent of the more concentrated solutions now to be purchased in ampoules. Dependence upon the local ice-plant for distilled water of uncertain age and bottling is obviously unsafe.

4. *Concentration of Solution.*—We desire to emphasize that, in our opinion, a 25 per cent solution (50 gm. in 200 c.c. of water) is the generally desirable strength. When this work was begun several years ago a 6 per cent solution was the first used, but the concentration has been gradually advanced up to this point as the direct result of the observation that the stronger the solution the more rapid and lasting are the effects. Moreover, some extremely unpleasant consequences have followed in some instances, notably in pneumonias, when the vascular system has been rapidly overloaded by a large volume of weak glucose solution. It is apparent that if the solution is weak a large amount must be given in order to carry a therapeutic dose of the glucose.

It is, we believe, a distinct advantage to use a strongly hypertonic solution because its hypertonicity actually favors a more rapid interchange between the

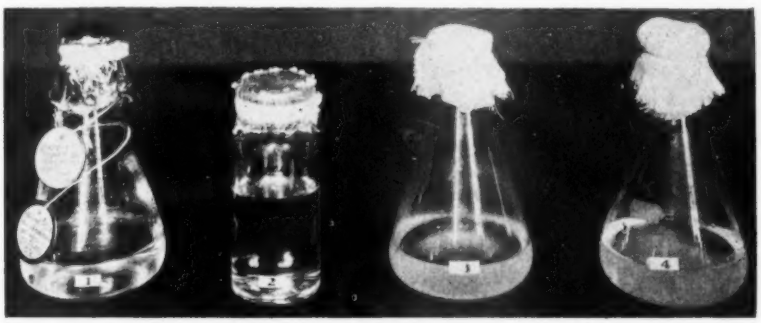

Fig. 1.—Typical flasks of glucose solutions. No. 1. Properly prepared and labeled flask of glucose solution. Note clarity, the lead-foil seal, and the space in flask above surface of solution which avoids wetting stopper by vacuum pressure in sterilizer or by splashing. Suitable for intravenous use.

No. 2. Properly prepared, clear solution but in wrong type of container. Note that stopper has become wet during sterilization of glucose solution and sugar has crystallized on foil seal. Unsuitable for intravenous use.

No. 3. Unfiltered solution. Cloudiness persists after sterilization. Unfit for intravenous use.

No. 4. Contaminated solution with growth of mould. Unfit for intravenous use.

tissues and the bloodstream, so that toxins are diluted, edema lessened, and the sugar seized and stored more rapidly by the tissues.

If more fluids are required it is safer to consider this as an entirely separate matter and administer them as submammary infusions of salt or weak glucose solution.

A 10 per cent solution of glucose should be considered, therefore, as about the lower limit of safety in dilution and a 25 per cent solution be preferred unless there is some definite indication for the immediate and rapid administration of additional fluid by the blood-stream route. It is quite likely that certain reactions are attributable to the injection of an excess of distilled water when weaker solutions are used.

5. *Sterilization.*—The flasks of glucose solution after being properly stoppered with cotton plugs in gauze and the top sealed with lead-foil, should be sterilized in a steam sterilizer for one-half hour at 100° C. on three successive days. It

may be prepared more quickly for emergencies by being sterilized in an autoclave at 15 pounds pressure for twenty minutes.

In either case sufficient space should be left between the level of the solution in the flask and the stopper so that the solution will not be forced by vacuum up against the stopper. This is also a precautionary measure against the possibility of splashing the solution against the stopper in any handling of the flasks.

Solutions showing caramelization or sediment after sterilization should be discarded.

6. *Age of Solution.*—Glucose solution kept in flasks stoppered with cotton, or cotton and gauze, and sealed with lead-foil will show comparatively little change in the hydrogen-ion content over a considerable period of time, even though buffer-salts have not been added, so that solutions may be prepared in advance of the need for them. One of the collaborators in an earlier one of these researches kept flasks of glucose solution on a laboratory shelf for six months with practically no change in acidity.[6]

As a matter of fact the greatest variation takes place during the course of the sterilization of the solution and from then on it remains fairly constant.

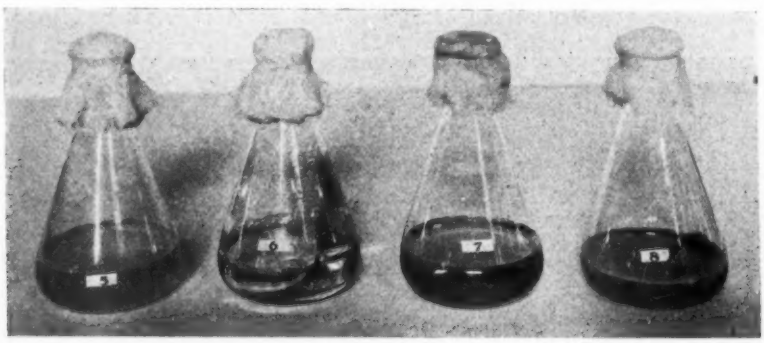

Fig. 2.—Typical flasks of glucose solutions.

No. 5. Solution made from a commercial corn-syrup. Light yellow color and impure. Unfit for intravenous use.

No. 6. Clear, thick commercial glucose. Unsuitable for use in solutions for intravenous injection because of impurity and stickiness. Note: flask was tipped to one side a moment before photographing. Viscosity is clearly shown in illustration.

No. 7. Solution partly caramelized from over-sterilization. Unfit for intravenous use.

No. 8. Thick caramelization from repeated sterilization. Unfit for intravenous use.

Solutions should preferably not be kept longer than four weeks unless hermetically sealed, and the fresher the solution the safer it probably is. It is seldom, however, that a reaction can be traced to a solution that is no more than from two to four weeks old.

7. *Ampoules of Glucose Solution.*—Ampoules of glucose (dextrose) solution are now on the market and apparently have been carefully and properly prepared by their manufacturers. Many of these have been used in our clinic with satisfactory results, and the only one open to particular comment is that of one firm to which cresol has been unnecessarily added as a preservative. This ampoule contains only 10 gm. of glucose so that if enough ampoules are used to obtain a therapeutic dose for anything other than insulin hypoglycemia, a reaction is a common aftermath on account of the total amount of cresol injected.

Hospitals which are using large amounts of glucose intravenously find it economical to prepare their own solutions, but for small services or emergency work these ampoules are very useful.

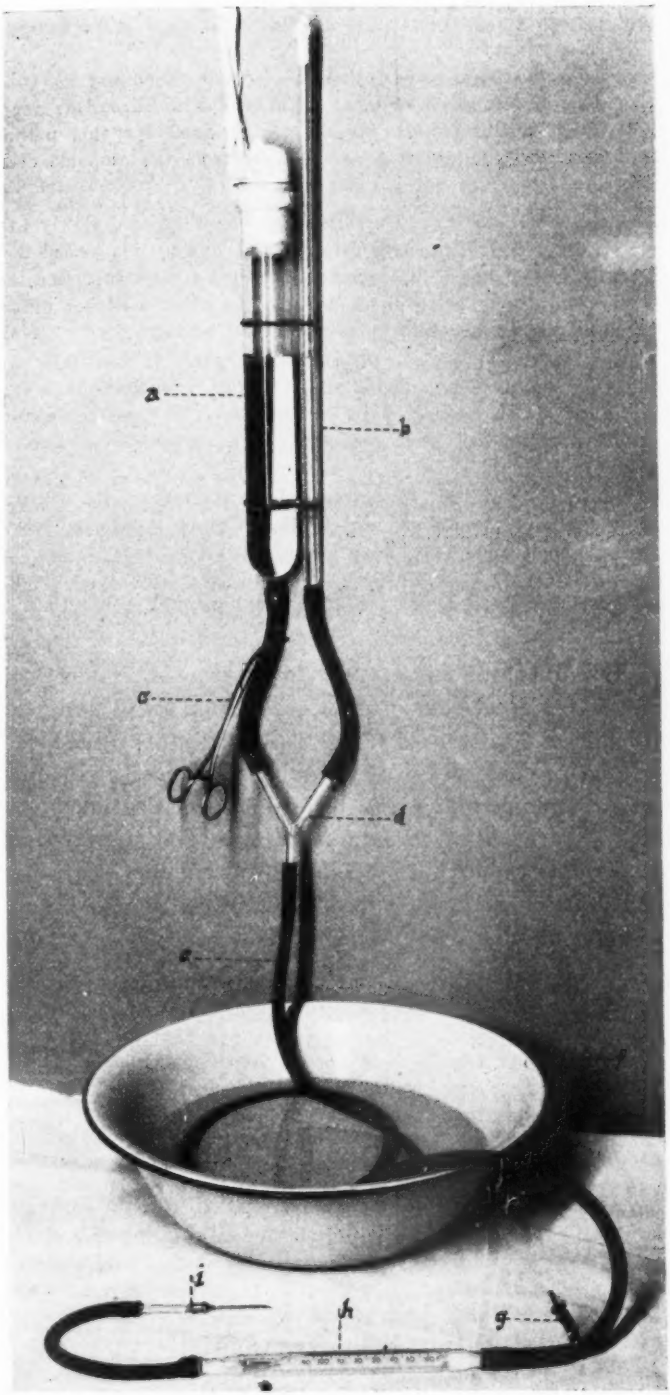

Fig. 3.—Infusion apparatus (Freidell-7): Arranged to control rate of flow and temperature of solution; as modified by Farrar at Woman's Hospital, New York.

(a) Infusion flask and (b) titrating burette held together by rubber bands. (c) Clamp shuts off flow from main flask while rate of flow is being determined from burette. (d) Glass Y-tube connects two flasks with (e) main rubber tubing coiled in (f) basin of hot water to maintain temperature of flowing solution. (g) Clamp regulates speed of flow and (h) infusion thermometer indicates temperature. (i) Adapter and intravenous needle.

For convenience and compactness they are usually prepared as 50 per cent solutions (25 gm. of glucose in 50 c.c. of water) with directions for diluting. If freshly distilled sterilized water cannot be obtained for this purpose, it is probably safer to inject the solution as it comes from the ampoule even though so highly concentrated.

8. *Technic of Administration.*—The injection should proceed slowly at the rate of 4 c.c. per minute for a 25 per cent solution, and during this period the solution should be kept hot. The solution is ordinarily injected from a salvarsan tube, using a small caliber needle, and having the tube coiled in a basin of hot water to keep the temperature of the flowing fluid up to from 100° to 110° F.

Fresh rubber tubing should not be used until after it has been thoroughly washed in running water, then boiled in clean water (without sodium carbonate), again washed, and finally sterilized in an autoclave.* Chemical contamination from new rubber tubing has been suggested as a cause of reactions following these injections.

The salvarsan tube and the connecting tubes, as well as the rubber tubing, should be thoroughly cleansed and then sterilized in an autoclave, because when merely boiled sediment from the water is often to be seen within the glass. Before beginning the injection the system should be rinsed out by running distilled water through the salvarsan tube, the rubber tubing, the connections, and the needle.

Briefly to recapitulate, therefore, it may be said that reactions following intravenous injections of glucose solution are usually the result of several general faults: (1) The use of impure glucose; (2) its being dissolved in something other than freshly distilled, uncontaminated water; (3) improper preparation and sterilization of the solution and the apparatus for its administration; (4) the administration of the glucose either too rapidly, too cool, or in too weak a solution.

To illustrate the foregoing several experiences of colleagues as well as personal observations should be appended:

Example I. A patient with pernicious vomiting of pregnancy was reported to have had a serious reaction with prolonged dyspnea and cyanosis following an intravenous injection of glucose. Investigation showed that the solution was prepared by a local druggist from a box labeled commercial glucose, that this was weighed on unwashed drug-store scales, dissolved in distilled water from an open bottle, and boiled for its sterilization. It was yellow and undoubtedly both impure and caramelized.

Example II. Following glucose injections several sharp reactions and one death (a prostatectomy case) occurred at a large hospital in this city. The solutions were usually prepared by the hospital biochemist and had never before given trouble. He was away on vacation, and investigation showed that the glucose used was chemically pure, but had been dissolved in 1 per cent salt solution. There was an odor of camphor which could not be explained, and the solution was not

*Note: Several months after the presentation of this paper before the Pittsburgh Academy of Medicine there was brought to our attention the report of a similar investigation conducted at Sloane Hospital for Women, New York City. While this report has not been published their conclusions were similar in many respects to ours, and particular mention was made of the effect of new rubber tubing in the causation of reactions. It was recommended that new rubber tubing should be treated before using as follows: (1) Soak in soap and water one hour, (2) Wash well with soap and water, (3) Wash in running water, (4) Soak for six hours in 4 per cent solution of sodium hydroxide, (5) Wash well in running water, (6) Wash well in distilled water. This technic has now been adopted in our hospital.

clear, containing tiny fragments of lint and other foreign material. It was given as a weak solution being either 5 or 10 per cent. The precise cause of the trouble could not be determined but was attributed to the combination of salt with the solution, and the failure to filter before sterilization. It is not unlikely that the distilled water used in making the salt solution may have been contaminated by bacteria in the laboratory before being sterilized.

Example III. Several reactions reported from another Pittsburgh hospital were found to be due, in spite of a clean clear-appearing fluid, to the fact that the glucose used in making this solution for intravenous injection was a thick syrup poured from a five-gallon tin can which was standing on the floor of the drug-room with a sticky, dirt-encrusted spout, and obviously a commercial and impure product. It had been injected both as a 5 and a 10 per cent solution so that at this dilution it was not too sticky to flow when hot, but at 25 and 50 per cent poured slowly and thickly.

Example IV. A colleague reported several deaths following intravenous injections at the Army base-hospital where he was stationed during the influenza epidemic. Twenty-five per cent solution was used and autopsy findings disclosed a thick, sticky substance clinging to the heart-valves. The assumption was that a 25 per cent solution is too concentrated to use, but as a matter of fact the likelihood is that the glucose supplied at the average Army base-hospital was the impure commercial glucose syrup in the tin-can container noted in Example III. It is noteworthy that the 50 per cent solution of pure glucose (dextrose) now obtainable in ampoules is not viscid and can be injected even at that concentration.

Example V. The charge-nurse of the operating room of a large hospital here showed a flask of glucose solution prepared for intravenous use. It was golden yellow, being about the color of thin maple-syrup, and she stated that this and the other flasks were regularly resterilized each Sunday morning! It should have been colorless, and repeated sterilization had probably not only caramelized it but also concentrated it until its percentage was an unknown factor.

Example VI. At another hospital the method of preparing glucose solution for intravenous injection was as follows: the druggist weighed out and made up packages of the required amount of chemically pure glucose. These were opened and emptied into a sterile flask when an injection was necessary. Sufficient sterile distilled water to make a solution of proper strength was poured over this and the whole injected. At no time was the sugar itself sterilized nor was the solution filtered.

Example VII. Mild reactions have occurred twice on our service when trial ampoules from two different manufacturers have been used on the same patient. The reaction came when the change was made from one preparation of glucose to the other.

Example VIII. A case illustrating the influence of too weak a solution as an occasional cause of reactions was seen in our own hospital. The interne on a surgical service was directed to administer intravenously a 10 per cent glucose solution to a patient with postoperative acidosis. The original glucose solution had been properly prepared; it was given slowly; and was kept at proper temperature. In regard to its strength, however, it was determined that the nurse had brought a flask containing 25 gm. of glucose in 100 c.c. of water, or a 25 per cent solution. A 10 per cent solution was called for, but in making the dilution the interne added 1000 c.c. of distilled water to the 100 c.c. of 25 per cent solution, considering the latter as though it were 100 per cent glucose without water so that the final mixture was merely distilled water gently sweetened.

To insure good results from intravenous administration of glucose solution, and to prevent unwarranted criticism of it as a therapeutic measure, it is advisable in home practice to use the proper ampoules of glucose (dextrose) now readily obtainable, or to have the solutions carefully prepared in a well-conducted laboratory. In hospital practice one person should be put in control of the entire work of the preparation of these solutions. The head nurse of the operating rooms is in charge of this work at our hospital and has specific instructions and directions regarding all details. She keeps the stock of chemically pure glucose, personally weighs or directs the weighing and filtration, as well as the bottling and sterilization, finally adding the label. This latter reads as follows: "Glucose—c. p.; 25 gm. in 100 c.c. freshly distilled water; sterilized on _____ (date); for intravenous use until _____ (date) only. Signed _____."

Intravenous injection of glucose solutions prepared and given under the conditions which have been outlined above will seldom, if ever, be followed by reactions.

The Head Nurse of the Obstetrical Department, Miss Nan Cooper, and the Head Nurse of the Operating Rooms, Mrs. Mary Zembower, as well as her predecessor, Miss Gertrude Beacock, have shown unflagging interest in this work. We are indebted to them for many practical suggestions which are included in this publication.

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LIGATION OF THE UTERINE ARTERIES FOR CONTROL OF HEMORRHAGE IN PLACENTA PREVIA*

By William Kerwin, M.D., F.A.C.S., St. Louis, Mo.

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THE ever-present high mortality to both mother and child in placenta previa is a source of great worry to obstetricians, and those who have had mishaps, will no doubt welcome a treatment which is reliable in the control of hemorrhage, especially the protracted bleeding following delivery of the child and placenta. The method occurred to me while handling a case of placenta previa centralis in March, 1925, at which time I was unfamiliar with the work of Harold Miller who had done the same operation in 1907 and reported eleven cases. The operation was apparently not generally adopted or fell into disuse as no further reports appear in the literature since that time.

The method deals with the ligation of the uterine arteries through the vagina. The technic is as follows:

A vaginal retractor placed anteriorly holds the bladder up, while a lateral retractor exposes the right lateral vaginal fornix; the cervix is grasped with tenacula and pulled downward, backward, and to the left; with a large curved needle threaded with plain catgut a ligature is thrown around the main trunk of the right uterine artery and tied. This can be accomplished by inserting the point of the needle in the upper part of the right vaginal vault just anterior to the midplane and carrying the needle inward and as high as possible so as to include all the lateral parametrium. The needle follows a course upward and inward toward the uterus and emerges through the vaginal wall about an inch posterior to its entrance. On the dial of the clock the entrance would correspond to ten and the exit to eight with nine representing the position of the uterine artery. The same procedure is carried out on the left side and when this ligature is tied all bleeding stops. No denudation of the vaginal wall is made and the operation can be completed in a few minutes. (Fig. 1.)

My first patient was in her fourth pregnancy which had been stormy owing to bleeding spells during the last two months caused by placenta previa centralis. Delivery of the child and placenta was followed by severe bleeding for which uterine packs and oxytoxics were used. The bleeding continued and a transfusion of 500 c.c. of blood was done. The uterus was repacked and more oxytoxics given but

*Presented before the joint meeting of the St. Louis and the Chicago Gynecological Societies at Chicago, December, 1926.

bleeding continued. There was good tone in the uterus but in this patient as is so often the case the lower uterine segment and the cervix continued bleeding and the patient rapidly became exanguinated. Manual compression and two more transfusions failed and the patient became pulseless. Ligation of both uterine arteries was done and another transfusion given. The bleeding stopped and did not recur. Both mother and child are living and another child has been born recently with no complications.

In a second case the ligation was done, as a prophylactic measure, after delivery. A third patient seen in consultation was practically

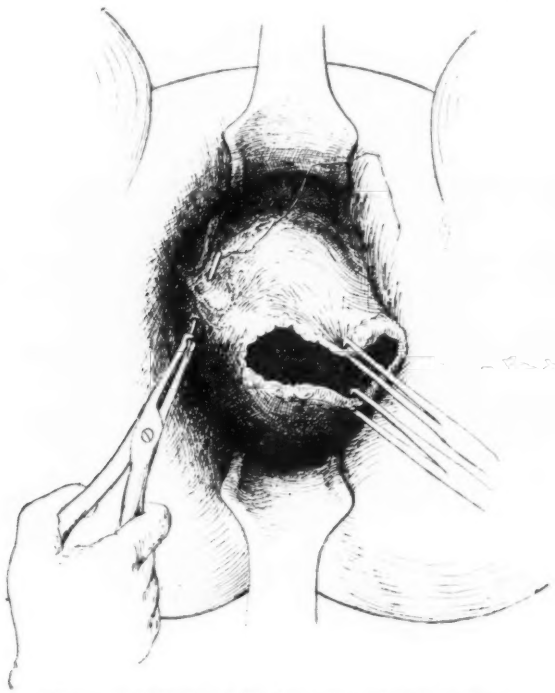

Fig. 1.—Method of ligating the uterine artery.

pulseless from hemorrhage which was not under control. Ligation stopped the bleeding, transfusion was done, and the patient survived. It is my opinion that in the first and third cases the patients were saved from death by the operation. No unusual changes occurred in the uterus because of the ligation and the puerperium was normal. The lochia became serosanguinous on the second or third days. The method can be used prophylactically before delivery in placenta previa but would be somewhat difficult of execution if the head were low down and fixed, which it rarely is in placenta previa.

Two questions to answer are: (1) Is the ureter in danger of injury? (2) Is it possible to ligate the artery without first exposing it?

The answers will be found in Fig. 2, which is a drawing of a specimen removed after doing the operation on a fresh postpartum cadaver. It will be seen that the ureter is about one inch from the ligature which completely compresses the main trunk of the uterine artery. The safety of the ureter is assured by upward retraction of the bladder and downward pull on the cervix which tend to establish a "safety zone" which is about one inch wide. The only requisites for doing the operation are the few instruments carried in the regular obstetric kit and a knowledge of the relative anatomy. It is presupposed that good obstetric judgment is used.

Henkle has advised the use of clamps for the purpose, but the type of clamp used to compress the parametrium is not at one's disposal

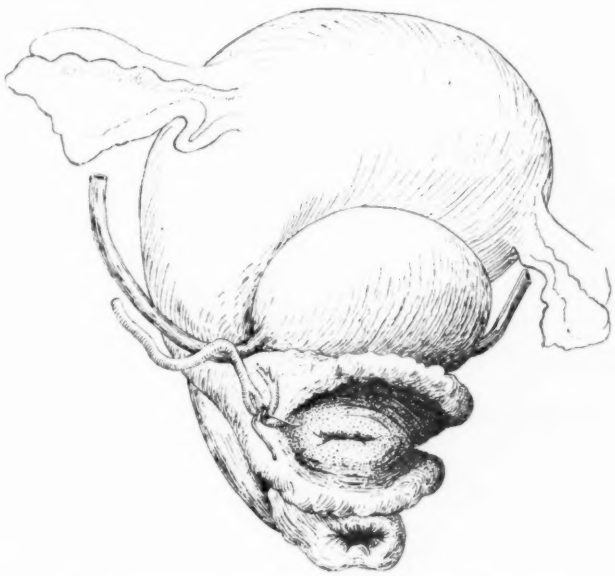

Fig. 2.—Cadaver specimen with uterine artery tied.

when needed and is more injurious to the tissues than a simple ligature. Should one include the ureter with a ligature of plain catgut no great harm would come, for the ligature would either be free in a few days or could be removed. The ligatures were not removed in my cases.

The operation should materially lessen the necessity for doing cesarean section in placenta previa and save many women who were heretofore doomed to death by hemorrhage.

SUMMARY

1. Ligation of the uterine arteries in placenta previa completely controls hemorrhage.

2. The method is simple and can be done in a few minutes by any qualified obstetrician either in a hospital or at home.

3. Cesarean section may not be necessary in the treatment of placenta previa.

4. Hysterectomy for bleeding after delivery is unnecessary.

5. Maternal mortality from hemorrhage should be greatly lessened.

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LISTER BUILDING.

THE SIGNIFICANCE OF INFLAMMATION OF THE UMBILICAL CORD*

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(From the Obstetrical Department, Henry Ford Hospital)

INFLAMMATORY changes of the umbilical cord have long been considered of more or less value in the diagnosis of fetal syphilis. Most importance has been ascribed to leucocytic and small round-cell infiltration of the vessel walls and adjacent connective tissue. Certain authors have also emphasized other changes such as thickening of the intima, with secondary vascular stenosis, edema with dissociation and even degeneration of muscle and elastic fibers, calcification, and gumma-like areas. Macroscopic findings have been considered of little value.

Bondi found changes in fifteen cords from thirty-one definitely and four probably syphilitic children. No cord from one hundred nonsyphilitic children showed inflammation, although there occurred such maternal complications as pneumonia, typhus fever, rheumatism, intrapartum and postpartum infection, and nephritis. He believed that positive findings were pathognomonic of syphilis but that negative findings were without significance. Seitz found the condition in syphilis only and believed it to be strong evidence of that disease. Ziegler was of the same opinion. Chiarabba saw inflammation in four instances of syphilis and believed gumma of the vein wall to be a specific lesion. Gargano mentioned small round-cell infiltration but stressed thickening and then destruction of the intima, dissociation of muscle fibers in the media, etc., as being the important syphilitic changes in the umbilical cord. Dominici found spirochetes where there were no gummata and believed that they could lead to the ordinary type of inflammatory exudate. Mohn found the changes in sixteen of twenty-four cords from syphilitic children. He believed that positive findings indicated a high probability of syphilis but were not absolutely characteristic. Thomsen, though finding one instance of inflammation in fifty-nine probably nonsyphilitic umbilical cords, concluded later from studies done with Boas that for practical purposes inflammation was diagnostic of syphilis. Livon thought that the changes in the umbilical cord were not specific for syphilis

*Read before the Detroit Obstetrical and Gynecological Society, February 7, 1927.

but should be considered as evidence along with the other findings. Williams has stated that, although inflammatory cord changes are particularly common in syphilis, they are also found in other conditions.[1] Rietz saw inflammation of the cord in three cases without any evidence of syphilis. Simmonds carefully studied four hundred umbilical cords, the fetuses being from ten centimeters in length to term size. Twenty cords from forty syphilitic cases showed inflammation. Among the three hundred and sixty nonsyphilitic cases, however, there were also thirty-two, or 9 per cent, with identical inflammatory changes. As a consequence, he believed that inflammation of the cord was of no diagnostic value.

Because of this divergence of opinion, a study was made of the umbilical cords in one thousand consecutive deliveries between seven lunar months and term. It was felt that the incidence of syphilis was determined with reasonable accuracy as follows:

Each mother during pregnancy, or shortly before in a few instances, received a careful examination, including a history and blood Wasser-

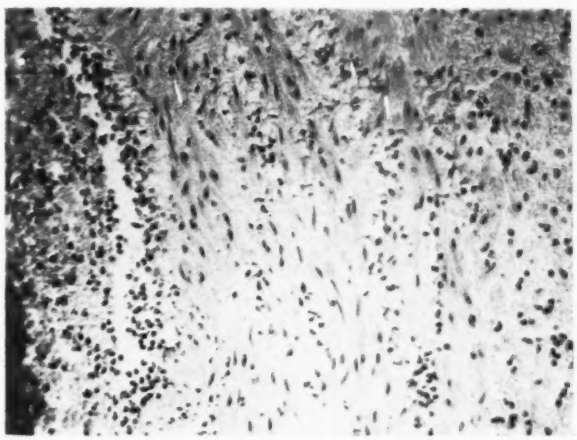

Fig. 1.—Moderate nonsyphilitic inflammation of an umbilical cord vein. The reaction extends into Wharton's jelly as shown above.

mann tests with plain antigen and at least one of the more delicate antigens, such as Kolmer's or the cholesterinized. In questionable cases, the fathers were given the same examinations. A large majority of the children who were stillborn or died in the hospital were subjected to postmortem examination. Where autopsy was refused, roentgenograms were made of the long bones, as was also the case with the majority of the premature babies and all of those born of syphilitic parents. In addition, three-fourths of the living children were under observation for periods varying from six weeks to two years. As a further check, all placentas were examined for syphilitic changes.

The placentas were inspected and weighed and, with the cords still attached, were hardened in formalin for three to eight weeks. Then, at least one section from each placenta and one from the placental

end of the cord were examined microscopically. In four hundred and fifty instances a section was also examined from the fetal end of the cord.

Although no placenta showed Fränkel's syphilitic changes, and though clinical and serologic syphilis occurred in only sixteen instances, definite inflammation of the umbilical cord was found sixty times, an incidence of 6 per cent. It is noteworthy that among the known syphilitic cases inflammation occurred only once. Perhaps this comparatively low incidence with syphilis may be explained by the fact that intensive antisyphilitic treatment had been given during pregnancy in all but one patient with clinical lues. Because of its high incidence, however, (6 per cent) among the nine hundred and eighty-four nonsyphilitic cases, it would seem that inflammation of

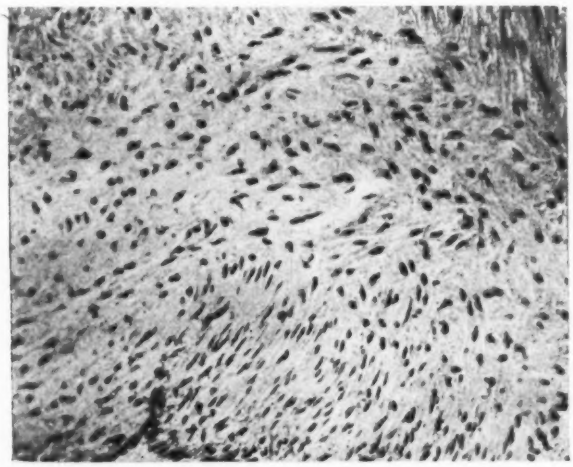

Fig. 2.—Slight inflammatory reaction in the wall of an artery from the same umbilical cord as the vein shown in Fig. 1.

the umbilical cord in itself should be considered very unreliable as a sign of fetal syphilis.

A study of the relationship of the inflammatory process to the extremities of the umbilical cords was of interest since in Bondi's material it was more intense at the fetal ends, while Thomsen, Dominici, and Simmonds found more reaction in the placental portions. Among our four hundred and fifty cords, of which both ends were examined, there were thirty-seven with inflammation. Fifteen had an equal degree of reaction at both ends, nine more at the fetal end and thirteen more near the placenta. In confirmation of Mohn and Livon, the changes were never present in the arteries only but were usually more intense and occasionally present alone in the vein.

With syphilis thus eliminated as a factor, some other cause for inflammation of the umbilical cord was sought. Simmonds found the

majority of the cord changes which were not accompanied by syphilis to be associated with the stillborn and premature children but determined no relationship to bacterial infection. Table I indicates an increased incidence among the stillborn and premature children in the present series. Furthermore, in the majority of cases there were certain associated conditions which are generally considered to be cause for, or evidence of, bacterial infection. Premature rupture of the membranes at or before the onset of labor occurred thirty-three times in the sixty cases; intrapartum temperature elevation to at least 100° F. was present eight times; and leucocytic inflammatory infiltration of the placental amnion and chorion was observed thirty-nine times. At least one of these conditions occurred in fifty of the sixty cases (83.3 per cent). The incidence was even greater with the fourteen cases of inflammation of the cord associated with stillborn and premature babies, since premature rupture of the membranes, intrapartum infection, and inflammation of the amnion and chorion occurred twelve, seven, and ten times respectively. At least one of the three was present in all but one case.

TABLE I. ASSOCIATION OF INFLAMMATION OF THE UMBILICAL CORD WITH STILLBORN AND PREMATURE CHILDREN

NUMBER OF BABIES		INFLAMMATION OF CORD	
		NUMBER	PERCENTAGE
Normal Term	937	46	4.9
Stillborn	27	5	18.5
Premature (Under 2500 gm.)	36	9	25.0
Total	1000	60	6.0

The significance of inflammation of the umbilical cord in regard to the child is of interest. Although five of the sixty children associated with inflammation of the cord were stillborn for various reasons, the immediate prognosis for those born alive (in agreement with Simmonds) was not affected by its presence; for, of this number (fifty-five) only three, all premature, died during the first six weeks of life. The child of the untreated syphilitic mother was the only one to develop signs of syphilis. It showed definite x-ray evidence of the disease, but for more than two years has done well under treatment.

SUMMARY

Inflammation of the umbilical cord occurred frequently even where syphilis was satisfactorily ruled out and is, therefore, of no value in the diagnosis of fetal syphilis. It did not occur with treated syphilis. Both ends of the cord were usually affected, but the intensity of the changes had a tendency to be greater at the placental end and in the vein. In the majority of instances there was evidence which pointed

to bacterial infection. The prognosis for the child was not affected by the presence of inflammation of the umbilical cord.

In conclusion I wish to thank Dr. F. W. Hartman for his kind assistance and advice.

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PREGNANCY FOLLOWING THYROIDECTOMY

By A. C. Williamson, M.D., Pittsburgh, Pa.

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THE enlargement of the thyroid gland during the early part of pregnancy has been observed for many years and it has even been felt certain that a number of pathologic thyroids are activated as a result of gestation. It is generally believed that the enlargement of the gland is a normal concomitant in from 65 to 90 per cent of all pregnancies. In searching for the causes of sterility, occasionally it will be found that small doses of thyroid gland may be of aid in overcoming sterility. It is also well known that patients with either a hypo- or hyperthyroidism generally have a definite menstrual disturbance, either an amenorrhea or a menorrhagia, both of which conditions may be alleviated or even apparently cured by the use of thyroid gland, regulated by careful checking up with metabolism readings. One writer[1] calls attention to the simultaneous occurrence of tumors in the thyroid, uterus, and breast. In two hundred cases, one hundred fibroids and one hundred thyroids, 50 per cent of the patients had both thyroid and uterine tumors and 5 per cent had breast tumors as well. A one time favorite explanation of eclampsia was that it was a result of a thyroid disturbance based partially on the fact that patients entering the last trimester of pregnancy with signs of impending toxemia, such as headaches, edema, urinary disturbances, might be

relieved by doses of iodothyrin. Some men are of the opinion that women with exophthalmic goiter should not marry or at least if they do, should not become pregnant. The apparent association of the thyroid and the sexual apparatus is well shown by[2] "the increased size of the thyroid often observed at puberty; the thyroid disturbance at the time of menopause; the frequent swelling of the gland during menstrual periods, pregnancy and lactation; the thyroid hypertrophy seen in animals after experimental castration; the influence of sexual activity upon the thyroid with the occasional onset of Graves' disease as a result of sexual excesses; the rare onset of hyperthyroidism after oophorectomy."

There is practically nothing in the literature regarding pregnancies that follow thyroidectomy and the usual feeling is that a patient who has had a thyroidectomy performed, apparently will resume her normal manner of living and probably have children with little or no disastrous results. It is without doubt true that with the carefully studied patient the thyroid treatment will restore her to normal life and she may have normal children. It is, however, to be particularly emphasized that altogether too frequently patients consider the operation as the cure, rather than as part of the process of recovery and instead of following a careful régime until all symptoms have subsided, go about as though they never were ill. Operation is merely an incident in treatment and should be considered as such rather than as an immediate cure. This series of cases as presented might modify to some extent the feeling that at any time after a thyroidectomy, all things being equal, the patient may be assured that she will have a more or less uneventful pregnancy and produce normal, healthy children.

It is a fair statement that the excellent results which are being obtained in the treatment of thyroid disease are due to a careful study of the patient from a standpoint of metabolism, rest in bed, radium, x-ray, surgical interference or a combination of these methods. It must be urged again that the follow-up of the patient together with specific instructions in regard to daily life has much to do with the success or failure of the treatment.

During the years 1921-1925, 706 patients suffering with thyroid disease entered the Western Pennsylvania Hospital and of that number 507 were operated upon, all but eleven patients recovering and being discharged as improved. There were four colloid tumors and 40 toxic adenoma. The results, as reported through answers to follow-up letters sent one year after hospital discharge, showed that there were entirely well, 22 of the hyperplastic cases, 18 of the exophthalmic, 8 of the toxic adenoma and no change took place in 6 exophthalmic cases.

Slight improvement (symptoms still present such as weakness, rapid heart, palpitation) in 30 toxic adenoma, and 16 exophthalmic goiters.

Some improvement (symptoms still present, tires easily, nervous, rapid heart on exertion) in 36 toxic adenoma and 16 exophthalmic cases. Marked improvement (slight nervousness, occasional rapid heart) was noted in 44 toxic adenoma and 34 exophthalmic goiters,—a total of 274.

The great value of these replies is in the fact that they present the patient's point of view or that of one of her near relatives and give

TABULATION OF CASES

Primiparae, 26; multiparae, 22.

White, 34; Negro, 14.

Multiparae, 12 had living children previous to operation; 9 had miscarriages previous to operation.

Average age, 26.

Average number of years married before thyroidectomy, 4 years.

All but three said they had never used contraceptives and might be termed sterile.

Duration of symptoms before operation, 4 to 11 months.

CHOICE OF TREATMENT

Thyroidectomy after rest in bed	34
Thyroidectomy after ligation	7
Thyroidectomy after x-ray treatment	3
Thyroidectomy after radium treatment	4
Number of surgeons operating	10

RESULTS

Type of Thyroid:	Toxic Adenoma	15	Well
		7	Marked improvement
		1	Some improvement
	Exophthalmic	14	Well
		6	Marked improvement
		2	Some improvement
	Benign	4	Well

Months intervening before delivery, 9 to 43 (Three were operated upon during pregnancy). Average, 21 months

Complications in Mothers,	Eclampsia	3
	Placenta previa	1
	Dementia	1
Complications in Babies,	Melena Neonatorum	5
	Enlarged Thymus	3
	Enlarged Thyroid	4
	Palpable Thyroid	2
	Stillborn	2
	Acephalic Monster	2
	Cretin ?	1
	Mongolian idiocy	1
Babies apparently normal		28

DATA IN REGARD TO ABNORMAL BABIES

Toxic Adenoma (Maternal)	Enlarged thymus	2	(One stillborn)
	Melena neonatorum	3	(All recovered)
	Enlarged thyroid	2	
	Cretin ?	1	
	Thymus	3	
	Premature	1	
Exophthalmic (Maternal)	Enlarged thyroid	2	
	Melena neonatorum	2	(One died)
	Congenital heart	1	
	Slow development	1	(Child did well on thyroid medication)
	Anencephalic	2	(One with enlarged thyroid as well)

an accurate picture subjectively of her actual condition without too many leading and suggestive questions.

This paper deals with the question of pregnancy following thyroidectomy with an attempt at analyzing the forty-eight cases observed from the standpoint of symptomatology and treatment together with an inquiry in regard to the possible causes of the actual phenomena present. It is true that forty-eight cases is not a large series and it may be true that the results observed during the pregnancy in the mother and the conditions occurring in the infants may be a mere coincidence but the abnormal figures presented would seem to be more than accident.

As far as the mothers were concerned there were certain symptoms we would expect, nervousness, with unstable blood pressure, restlessness, constipation, nausea and vomiting. The treatment for the most part consisted in definite rest periods in bed each day during the first three months. Two patients were kept constantly in bed for sixteen weeks. Palpitation, shortness of breath and fear were among the most troublesome of features. For alleviation of symptoms bromides were used in varying doses alternating with other soporifics such as veronal, given in five-grain doses every other night. No one soporific was given over any extended period of time. For constipation, fruit juices, buttermilk and simple laxatives, the saline preferably, were employed, the laxatives given in small repeated doses rather than in one large dose daily. Constipation was the most difficult matter to obviate and when the cathartics were ineffective enemata were resorted to every other day. Thyroid preparations in small doses, grain ¼ to one grain b.i.d. seemed to be of value but not absolutely so, for frequently the patient would become nervous and complain of headache as well and the medication would have to be discontinued temporarily. A simple preparation of iodine such as syrup of hydriodic acid, fifteen drops every other day for pregnancy period together with calcium lactate in five-grain doses, seemed to be of aid but here again two patients reacted badly and iodine was stopped. Generally speaking, the majority did fairly well after the fourth month, especially if there was the least swelling about the thyroid scar, in other words if the portion of gland remaining was sufficient for function. The vomiting cases were obstinate and had to be put to bed on a rigid régime, starting in with fluids by rectum only, and gradully building back to the normal diet again. One patient went through this experience three times and two others twice.

Of the mothers all the multiparae went through to term. All the primiparae but two went through to term, of these one miscarried at three months and one died of eclampsia in her seventh month. Of the maternal thyroid type, where the babies were affected as shown in the

following table there occurred ten toxic adenomas and twelve exophthalmic goiters. None of these mothers was well after operation and all complained of weakness, nervousness and palpitation. All the babies were born within two years of the operation. It is regretted that only nine of the mothers had metabolism readings taken and they were all primiparae. The readings ranged from +22 to +44, in other words all these patients were still showing evidence of thyroid disturbance and were not well following operation or else the pregnancy had been questionably responsible for starting the recrudescence of the old condition.

DISCUSSION

It should be noted that in every case where difficulty with the baby occurred, pregnancy and delivery occurred within two years after the thyroidectomy. In every case the mother had not recovered from the effects of the operation and in practically every case had complained of the same symptoms as before operation, although she may have been improved as far as the original condition goes. It is a self-evident fact that for a successful result in thyroid treatment the patient must obey instructions implicitly in regard to rest, medication and diet following operation, and a pregnancy should not be considered until she is as well as the accepted tests prove her to be. All were married for some time before their operations and all asserted that they had never done anything to prevent pregnancy, this apparently bearing out the usual testimony that patients with thyroid difficulty either do not become pregnant, or else miscarry early in gestation. It has been noted repeatedly that exophthalmic types either become markedly worse and miscarry before the third month or else rapidly improve if they remain pregnant and pass the first trimester without accident. In the cases where the baby was born with enlarged thyroid the mother's symptoms decreased in severity as the pregnancy proceeded. In the eclampsia patients there are a few factors worthy of note: The symptoms came on suddenly with no warning; two recovered and one died. All three had unstable blood pressures in that the least exertion or excitement would cause a variation of as much as sixty points. The patient who died had seventeen convulsions; the two living had six and nine convulsions respectively. None showed albumin in the urine until after the onset of convulsions and the amount increased as the condition proceeded. All had fever when first seen after their seizure, ranging from 102° to 104°. All three had been seen within three days of the attack and blood pressure and urine showed nothing abnormal. During the eclampsia the highest blood pressure recorded was 145 systolic. The blood chemistry was essentially negative, aside from the not unusual ratios between the N.P.N. and U.N. of 3:1 instead of 2:1. There was

no marked increase in the uric acid content and none in the carbon dioxide tension reading. There was no edema in any of the patients and in one patient only was there a warning sign of headache, which the patient discounted and disregarded. Subjectively during pregnancy these three patients were intensely nervous, easily tired and troubled with rapid pulse. They had obstinate constipation. The thyroid region at no time showed the least evidence of swelling about the scar. The question could be raised here as to whether sufficient thyroid tissue had been left to function throughout their pregnancy and as to whether there might not have been interference from the parathyroids so that the eclampsia might be termed an endocrine one rather than one where the forewarning signs of rising blood pressure and edema promised an eclampsia of faulty elimination.

As far as the infants are concerned it is impossible to definitely pick out certain types of abnormalities where we might say that given a mother with a toxic adenoma we might prophesy the type of abnormality likely to occur in the baby. It is fairly well established that babies born of goitrous mothers may also develop goiter, and for that reason the prophylactic use of iodine during pregnancy may guard the child in utero. In this series it was found that all mothers did not tolerate iodine well and again it reverts back to the question as to whether the disease in the mother was not still present as evidenced by the symptoms and that the disease in her must be treated as such. The definite relationship between the two cannot be doubted. It has been shown[3] that if a partial thyroidectomy be done in dogs, puppies with markedly enlarged thyroids, probably due to the attempted compensation for the maternal deficiency, will be born. Guggisberg and Kehrer[4] found that thyroid extract definitely increased uterine contractions and this may account for the fact that patients with hyperthyroidism at the time of labor definitely suffer severely from vigorous uterine contraction. It must be admitted that the patients here as presented, probably in the first place were severe cases and the problem of treatment required great care and study. They have been the poorer risks and when the extra load of pregnancy is thrown upon them there is not sufficient reserve to stand the strain.

Therapeutically all patients must be treated cautiously and if thyroid or iodine is given it must be with the careful observation of the effect upon the patient. One of these patients, an exophthalmic type, with placenta previa, was packed postpartum with iodoform gauze and within an hour she had a temperature of 104°, a rapid thready pulse of 160, and it seemed as though she was not going to live. The pack was removed and within an hour all symptoms had subsided and she was sleeping quietly. It is an open question as to whether the absorption from the pack may have caused the trouble. Ten days later she was given a single 5 drop dose of Lugol's solution and again

she showed a temperature of 101° and a pulse of 136. Four hours later she was apparently normal. McCarrison's work[5] on faulty diets and their effects on the endocrines must be borne in mind, especially where we have a relative loss of iodine together with an excess of fat in the food. The value of metabolism readings is of the utmost importance for the check-up on patients and their treatment.

CONCLUSIONS

1. No thyroid patient after operation should become pregnant for at least two years, even though her symptoms be alleviated.

2. If a thyroid patient after operation becomes pregnant, we must treat her cautiously with iodine, thyroid substance, sedatives and rest.

3. Metabolism readings should be taken for the accurate estimate of the case.

4. The patient cannot be assured that she will have a normal baby if she is still having symptoms referable to the thyroid.

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THE VALUE OF THE SUGAR TEST IN THE DIAGNOSIS OF PREGNANCY*

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THE obvious advantage of a desirable clinical examination for the accurate determination of the gravid state has long been recognized. Numerous criteria have been suggested, from the complicated Abderhalden reaction to simpler observatory phenomena. It is not our purpose to recapitulate this store of information, but rather to discuss a single feature of it,—viz., sugar tolerance during pregnancy, and the utilization of this principle as a diagnostic aid. With a rather brief résumé we shall present the result of the observations made on the Gynecological Service at the Jefferson Medical College Hospital.

That pregnant women show a decreased tolerance to carbohydrate ingestion is a definitely established fact.

In 1895, Von Jaksch[1] and Lanz[2] described a resultant glycosuria from glucose ingestion in pregnant women. Confirmation of these findings have been presented at intervals, but it was the paper of Frank and Northmann,[3] in 1920, that created

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recent interest by presenting the principle as a diagnostic test in pregnancy and describing a technic. Their work, with technical modifications, has been followed by that of others with varying results, all dependent upon this principle, and several of these papers will be mentioned later.

Ehrenfest,[4] in a recent contribution, sets forth in a lucid manner the study of carbohydrate metabolism during pregnancy. His opinion is especially clarifying in distinguishing between, (1) renal diabetes; (2) alimentary glycosuria; (3) the glycosuria occurring during pregnancy. In the first condition he speaks of a low threshold and an increased renal permeability, and secondly he refers to a "definite weakness within the mechanism of carbohydrate utilization." In the third type, however, he believes that it may be ascribed to a "prompt lowering of the renal threshold, required during pregnancy as a protective measure in the face of greatly accelerated sugar mobilization," which shows a weakness "only in a distinct lowering of her ability to assimilate properly one large dose of carbohydrate."

Ehrenfest also outlines the rôle of the endocrines in the pregnant woman, theorizing in detail upon the changes occurring in them in relation to carbohydrate metabolism, and quoting liberally from the experimental work of many investigators. He concludes that it is these endocrine changes that combine to produce that type of glycosuria peculiar to the pregnant woman, in contradistinction to the carbohydrate metabolism occurring in the nonpregnant state. Recent investigations, however, scarcely bear out this interpretation, since the modern view, expressed by Kleesattel,[5] is that the sugar in the urine of pregnant women is correlated with low alkali reserve.

With the above principles in mind, it is interesting to consider for a moment the experiences of earlier observers in performing carbohydrate tolerance tests, excluding the phloridzin and the Roubitschek methods from the discussion.

Frank and Northmann's technic consisted in the ingestion of 100 gm. of glucose on a fasting stomach, after securing a preliminary specimen of blood and urine to be examined for sugar content. They then collected urine specimens every fifteen minutes for two hours, and blood specimens every hour for two hours. Considering 190 mg. per 100 c.c. of blood as top normal, they found that the glycosuria always appeared within one hour in positive cases. They reported 19 cases of pregnancy diagnosed in this way, with no failures, but observed that the test was unreliable after the third month of pregnancy.

Welz and Van Nest,[6] using a modified technic, found the test satisfactory in 95 per cent of the cases studied.

Hirst and Long,[7] in their first paper collected the results of a number of investigators, demonstrating a total of 247 positive results in 259 cases tested, and presented their own studies. In 15 confirmed pregnancies, 14 gave positive results up to the end of the fourth month, while 4 were positive and 3 were negative after the fourth month. They reported no positive results in the absence of pregnancy. In their second paper, the same investigators[8] reported 150 cases studied; in 88 cases definitely pregnant, the test was positive in 83 (94 per cent); in 62 nonpregnant cases the test was negative in 57 (92 per cent).

Bauer[9] reported satisfactory studies in both groups; Hofbauer[10] to a lesser extent. Williams[11] secured positive results in a small series of cases by the original technic, but showed discouraging results with some of the modifications.

Seitz and Jess,[12] on the other hand, reported 55 per cent of positive results and 57 per cent of negative results in nonpregnant cases. An unruptured ectopic pregnancy was negative. Zondek[13] and Hellmuth[14] concluded that the test was of rather doubtful value.

Dietrich[15] reported 64 per cent of positive results in pregnant cases, and quoted a similarly low percentage in the work of Hallauer, Freund, Sachs and Bathe as reported by the latter author.

Nurnberger[16] claimed that in abortion there is a positive reaction as long as most of the placenta remains attached, the same being true of ectopic gestations. He regarded this as an aid in the prognosis of a threatened abortion, claimed ability to thus distinguish between the latter and a complete abortion, but not between complete and incomplete ones, because of the degree of placental remnants remaining. His results in the diagnosis of pregnancy were uniformly correct.

Lembcke and Lindig,[17] while reporting gratifying results with the test, mentioned an ovarian cyst as giving a positive reaction.

SCOPE OF THE INVESTIGATION AND TECHNIC

Our attention was called to this subject by the satisfactory results reported by several investigators, notably Hirst and Long, and accordingly we commenced observations on the Gynecological Service at Jefferson Medical College Hospital in December of last year (1925). The modified technic of Hirst and Long was employed, using 120 gm. of cane sugar or glucose, dissolved in water, and flavored with lemon or orange juice, cane sugar in about half of the cases, and glucose in the remainder. It was pointed out by Rowe,[18] in a paper at Toronto in 1921, that it is immaterial whether one uses sugar or glucose in testing the tolerance. Withholding breakfast, a preliminary specimen of voided urine was secured, and labeled "No. 1"; then the sugar solution given, and specimens of voided urine secured at one- and two-hour intervals and labeled "No. 2" and "No. 3." All specimens were then examined for sugar by Benedict's method. If sugar was found in the preliminary specimen, a differentiation was attempted; if found in the second and third specimens, and not in the first, the test was regarded as positive, and a blood-sugar estimation performed. If negative for sugar, the test was classified as "negative" and no blood-sugar study made. In positive tests, glucose was regarded as the reducing sugar, since the fact has been rather definitely established, that with a negative preliminary specimen, the sugar appearing in the urine after the ingestion of glucose is the same, especially when Benedict's test is employed. Blood-sugar estimations in positive cases were made on the morning following, breakfast being withheld. The rather lengthy blood-sugar tolerance test was not considered essential. Rowley[19] of the Mayo Clinic has shown rather definitely that the average range for blood-sugar concentration in normal pregnant women is 0.09 per cent to 0.11 per cent, which is the same as that found in nonpregnant women.

It was decided to carry out the sugar tolerance tests on cases of actual or suspected pregnancy, intra- or extrauterine; threatened or incomplete abortions; postabortal or puerperal infections; complicated pregnancies; myoma of the uterus, simple or complicated; ovarian

cysts; pelvic inflammatory disease; study cases of doubtful diagnosis, especially with abdominal or pelvic enlargements. In some instances, tests were carried out after uterine evacuations, and in certain post-operative abdominal sections, for definite reasons that will soon be mentioned. Sometimes, notably in ruptured ectopic gestations, the necessity of instant operation precluded tests being made. Unfortunately, as is so frequently the case, patients have signed releases and left the hospital before all the desired studies could be made. The investigations were continued until the latter part of October, 1926.

It has been our earnest desire to estimate the real value of the sugar test in the diagnosis of pregnancy; to determine its reliability in doubtful cases, both early and in the later months; to observe the results encountered in nonpregnant cases, and thus prove or disprove the desirability of the test as a practical aid to the obstetrician and gynecologist.

ANALYSIS OF RESULTS OBTAINED

Eighty-two sugar tolerance tests were carried out,—19 in patients found to be definitely pregnant, and 63 in nonpregnant cases. In the first group, 11 were positive and 8 negative; in the second group 20 were positive and 43 negative; 57.9 per cent and 68.2 per cent respectively, or 31.7 per cent positive results in nonpregnant cases. Let us briefly analyze these results.

Uterine Pregnancy Cases.—In 17 cases, the test was positive in 11, and negative in 6. All but one were three months' pregnant or less; with three exceptions these pregnancies were complicated: threatened abortion, 5; toxemias of pregnancy, 3; pyelitis, 3; salpingitis, gall bladder disease, and myoma of the uterus, each one. In two of the positive cases, the preliminary specimen was positive for sugar; both blood-sugar estimations, however, were normal. The highest blood sugar recorded was 158 mg. in a patient giving a positive test, and whose pregnancy was complicated by cholelithiasis. Ordinarily her urine was negative for sugar. In another patient, the test was negative three times, the blood sugar being 0.066.

Extrauterine Pregnancy Cases.—Four cases were studied. In two of the cases, in which the test proved negative, unruptured ectopic gestations were present, and were operated upon. One of these cases was particularly interesting. The patient had been admitted to the ward as an incomplete abortion, and it was reported that placental tissue was extruding from the external os. After several days' rest in bed, the temperature not being elevated, a curettage was done, with little resulting material. At this time some enlargement of the left adnexa was noted, but believed to be inflammatory, and the patient was treated accordingly. She felt exceptionally well for several days, when she began to complain of severe pain in her left side, accompanied by a

rapidly enlarging mass above Poupart's ligament and definite signs of internal hemorrhage. Abdominal section was immediately performed, and a left ruptured ectopic pregnancy found with profuse hemorrhage into the left broad ligament. Fortunately the patient recovered, with the aid of blood transfusion.

In a third case, operated upon for pelvic inflammatory disease, in which the test was negative, an old tubal abortion, with considerable blood clot was found. In all of these cases, ectopic pregnancy had been considered nonoperatively. In the fourth case, operated upon as an emergency ruptured ectopic pregnancy, a positive test was secured two weeks after the operation. The blood sugar was normal.

Incomplete Abortions.—Of twelve cases studied, 8 were negative and 4 positive. Curettage was performed on 3 of the negative cases, and placental tissue removed in each instance, the other 5 subsiding spontaneously. In 2 of the positive cases, curettage was performed, and a week later positive tests again obtained. The blood sugar was normal. The other 2 cases subsided, signed releases, and left the hospital.

Nonpregnant Cases—Myoma of the Uterus.—In uncomplicated myoma of the uterus, 6 cases were positive, and 7 negative. The blood sugar was normal in these cases. In several of these patients, pregnancy was suspected, and secretion was present in the breasts of two. All but one were operated upon, or given radium.

Myoma of the Uterus and Inflammatory Disease.—In four cases, one was positive and three were negative. The blood sugar was normal in the positive case. There were no unusual features about any of them.

Pelvic Inflammatory Disease.—In 15 cases, there were 4 positive tests. The blood sugars were normal in these cases. Of the 11 cases giving negative tests, ectopic pregnancy was considered in 2; in 2 of those giving positive tests, a similar condition was thought of. All were inflammatory without doubt.

Postabortal Infections.—Of five cases, one gave a positive test. This patient was lactating, and also showed sugar in the preliminary specimen. The blood sugar was 0.081, and lactose was found in the urine. In one of the four cases giving negative reactions, pregnancy was considered, but ruled out definitely.

Ovarian Cysts.—Of three cases, one gave a positive test. Pregnancy was a possibility. The test was repeated a week after operation and was again positive. The blood sugar was normal.

Subinvolution and Endometrial Hyperplasia.—Two cases of subinvolution, and one of endometrial hyperplasia, gave negative results with the test. In the latter case ectopic pregnancy was considered on admission.

Ureteral Stricture.—Two cases fell into this group: one was positive, and one negative. In the former instance there was a question of re-

tained placental tissue from a rather recent premature birth. The curet and the cystoscope decided the issue. The blood sugar was normal. The latter case was also admitted for study and the diagnosis made clear.

Cardiac Disease.—Two cases gave negative findings. The question of ectopic pregnancy and incomplete abortion was ruled out in each case.

Hydatid Mole, Tuberculous Peritonitis and Endocrine Imbalance.—A case admitted as a threatened abortion twice reacted negatively. Convinced that the patient was pregnant, she was discharged to return for dispensary observation. Instead she went to another hospital and was operated upon, an hydatid mole being discovered. A case of tuberculous peritonitis was negative. A positive test was secured in a patient twenty years old, admitted because of generalized abdominal pain. She was said to have never menstruated, and had at one time been on the medical service, when a diagnosis of congenital lues had been made. We considered her as an endocrine case as well. The blood sugar was normal, and a Roentgen study of the skull showed no pituitary pathology.

CONCLUSIONS

1. From the result of our studies, indicating less than 60 per cent of positive reactions, we conclude that the sugar test is not reliable as an accurate diagnostic aid in pregnancy. Decreased carbohydrate tolerance, however, as evidenced by women in the pregnant state, apparently differs from the renal or alimentary type of glycosuria, and is interpreted at the present time as due to the depletion of base in the body of the pregnant woman which is conductive to a lowering of sugar metabolism.

2. We have found the test of no practical value in determining the status of a threatened, incomplete or completed abortion.

3. The large number of positive results in the nonpregnant cases, less than 70 per cent being negative, further emphasizes the unreliability of the test, particularly since the question of the differential diagnosis from pregnancy arose in a number of instances. These positive reactions, with normal blood-sugar findings in all but one case, are probably explained upon the basis of an alimentary or renal glycosuria.

Following the discussion of my paper at the November meeting of the Obstetrical Society of Philadelphia, I carried out a series of sugar tests to meet Dr. Hirst's criticism, using 7.5 gm. of sugar to every 10 pounds of the patient's body weight, with the following results:

75 per cent of positive results in cases actually pregnant.
38.8 per cent of positive results in nonpregnant cases.

The percentage of positive results in nonpregnant cases exceeds that obtained in the first series studied; the percentage of positive results in patients actually pregnant is also higher than in the first series, but fewer cases were observed.

It demonstrates, however, that it makes little difference whether a definite amount of sugar, 120 gm. or 7.5 gm. for every 10 pounds of body weight is used in carrying out the test, and to our mind, the test cannot be relied upon in differentiating pregnancy from other intraabdominal conditions.

Space does not permit of a detailed discussion, but the differential diagnosis of pregnancy from other conditions was an important issue in a large percentage of the cases tabulated.

I take this occasion to thank Dr. Anspach, Chief of the Gynecological Service at Jefferson Hospital, for the opportunity of presenting these observations. Thanks are also due to the resident physicians, nurses, and laboratory personnel for their earnest cooperation, and to Dr. Morse, head of the Chemistry Department at Jefferson Medical College, for valuable suggestions.

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(*For discussion, see page* 265.)

THE CASE-TEACHING METHOD IN GYNECOLOGY

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IN THESE days of an overcrowded medical curriculum it is necessary that each teacher give careful thought to the question of using most advantageously the limited time assigned to him.

The things which might be studied with profit are numerous enough to occupy a period of many times four years. The first problem, therefore, that the teacher must face is to determine, by elimination as well as selection, what things are to be taught. The second problem is to decide upon the manner of that teaching.

The guiding principle in selecting the subject-matter of a course should be the admitted fact that the purpose of the undergraduate medical curriculum is to train men for the general practice of medicine. Those who will eventually work in a special field must expect to get their special training later. A common fault of the specialist-teacher is to present his subject to undergraduates as he would to a

class of intending specialists in that particular field. Perhaps the laboratory teacher is even more inclined to this fault than is his clinical brother. There is much truth in Dr. Ray Lyman Wilbur's statement that the specialist is at times a positive menace to the undergraduate student.

The gynecologic training of the future general practitioner must equip him along the following lines:

1. He should have a broad general idea of the scope of the gynecologic field and of its interrelations with other departments of practice.

2. He should obtain the greatest possible amount of personal experience in diagnosis, which is by far the most important item in his training. Other knowledge will come naturally with this; without this, other knowledge is useless.

3. He should have some acquaintance with the simpler methods of treatment as applied to common minor gynecologic ills.

4. He should know when to refer a patient for treatment to a specialist and what can be expected of such treatment.

The specialist-teacher faces a constant temptation to include other things in his course. The detailed histology and embryology of the female generative tract; microscopic gynecologic pathology; operative technic; controversial material; the particular hobby of the individual instructor, all of these are interesting, and all of them would be excellent things for the student to know. All of them must, however, be strictly excluded from the undergraduate course, so long as their inclusion in a limited program would in any degree force out other more essential things.

There are several teaching methods that can be employed in a clinical course. Among them are the didactic lecture, the formal quiz, the amphitheater clinic, the ward clerkship, the out-patient section-work, the informal conference, and the case-teaching exercise.

The tendency today is happily against any great amount of purely didactic work. A long course of such lectures on a clinical subject is likely to develop into one of two things, either a profitless review of the textbook, or a specialized discourse on the particular interests and views of the speaker, suitable for advanced but not for elementary students.

The formal quiz is an objectionable method, out of keeping with university standards of education. The few who recite may learn something from such an exercise, but the majority of the class spend a tedious and unprofitable hour.

Of all clinical subjects, gynecology is one of the least well able to employ the amphitheater clinic for undergraduate teaching purposes. Operative clinics before a class of future general practitioners are a waste of time; nonoperative amphitheater clinics are a waste of op-

portunity, since the cases could be studied much better by sections of the class.

The ward clerkship has many advantages, but these are as a rule to be obtained only after the student has become well introduced to the routine of the hospital. The short clerkships in gynecology which can be crowded into the undergraduate course are likely to involve a considerable waste of time.

The ideal way of teaching gynecologic diagnosis, with certain elementary facts about treatment, would be to have the student in the out-patient clinic for a year. At the end of that time he ought to be fairly well trained along the necessary lines. Since actually he can stay in the out-patient clinic only two or three weeks, it is necessary to find some supplementary short cut to knowledge.

Assuming that ninety hours in the third and fourth years are to be devoted to the teaching of gynecology, the following program is suggested.

1. Ten hours of didactic lectures, dealing in a very general way with the scope of gynecology and the general problems involved. These lectures should come in the third year, and preferably in the first term; at any rate, as far as possible they should be given before the student begins his clinical work.

2. Forty-eight hours of clinical teaching of small sections in the out-patient department, divided into twelve half-day exercises of four hours each. Three hours at least of each exercise should be spent in actual contact with patients. The other hour might be devoted to informal conferences on subjects suggested by the clinical material at hand, to the study of gross pathologic specimens, to the occasional demonstration of some special method of investigation in the clinic, and, rarely, to the witnessing of an operation on a case previously seen by the students. This out-patient work might come in the third or fourth year, but preferably after the lectures have been given.

3. Thirty-two hours of case-teaching. This should come in the fourth year, after the students have done their out-patient work.

While it is not claimed that forty-eight hours in the out-patient department plus thirty-two hours of case-teaching will be the equivalent of a year in the out-patient clinic, I do believe that such a combination will be much more profitable than forty-eight hours of out-patient work plus another thirty-two hours of out-patient work, or plus thirty-two hours in the wards, or plus thirty-two hours spent in any other way.

Forty-eight hours devoted to examining out-patients will give the student a fair elementary training of the eye and hand, and will do this as well, for all practical purposes, as would eighty hours similarly spent. Forty-eight hours in a busy out-patient clinic will not go far

in training the student's mind to correct gynecologic thinking; eighty hours would not go appreciably farther. Thirty-two hours devoted to case-teaching, following upon the training of the eye and hand, will accomplish gratifying results along this line.

There are several advantages peculiar to the case-teaching method. For one thing, the instructor can marshal before his students in a series of thirty-two one-hour exercises a carefully selected array of cases such as the haphazard material of the out-patient department might not present in the course of many months. As a second thing, it is possible to present each case in its entirety, including actual treatment and end-result. In the third place, one can dwell upon the various features of the cases with a thoroughness rarely possible in the course of a busy clinic, and with a frankness which is often inadvisable in the presence of the patient.

It may be urged in objection that case-teaching is a reversion to the didactic methods which we are nowadays tending to discard. A little reflection will show that this criticism is unfounded. In some departments of medicine teaching without the patient would be decidedly impractical. In dermatology, for example, one look is probably worth more than ten printed pages. In gynecology, however, the situation is different. Here certain data must first be obtained through direct contact with the patient. Following this, one must then by a process of reasoning draw from these data conclusions as to diagnosis, and formulate plans for treatment. Such a process of reasoning can be carried out just as well if the necessary data are presented on paper, as when they are elicited at first hand. The keynote of the method is that it encourages the student to do individual thinking under proper guidance.

The case-teaching exercise can be handled with a fairly large section of students. Between twenty and thirty men make a section of convenient size; when the number is greater than thirty, it is difficult to keep the exercise on an informal basis. If two or three men take an active part in the discussion of each point that comes up, then one can expect to hear from the whole section during the consideration of a single case.

The best success of the method will depend largely upon the personal equation of the instructor. A certain latitude must be allowed each individual teacher in his manner of conducting the exercise, for thus each will accomplish the best results.

The following is a useful plan. A case is assigned at the beginning of the hour, and the opening five minutes are devoted to silent consideration. Then some student is asked to state in general terms the problem or problems involved. This contribution will serve as a point of departure, and discussion of the case can then proceed. Usually the first business will be to enumerate the various possibilities in

diagnosis, with the points in favor of and against each. Data omitted from the case-record may be supplied by the instructor, who will in a general way guide the discussion into profitable channels. Most of the actual talking, however, should be done by the students themselves. They are led to advance ideas, and to comment upon and criticize those ideas. When a diagnosis has been reached, prognosis and treatment are taken up. These are discussed in the fullest detail, emphasis being laid upon the manner in which they would be presented to the patient in actual practice. Finally the treatment carried out and the end-result in that particular case should be made known, and the reason should be considered for any errors of judgment that are discovered. The study of the first case will usually occupy about thirty-five minutes. A second shorter case can then be taken up during the remainder of the hour; this may well involve a related problem which will throw further light upon what has been learned from the first case.

An alternative plan is to announce beforehand what cases are to be taken up at a stated exercise, thus giving the student opportunity for preliminary thought and discussion. This method makes for economy of time in the classroom, but may detract somewhat from the spontaneity of the exercise, as students are likely to come with more or less fixed ideas. In last analysis, the most advantageous manner of conducting case-teaching exercises will gradually be evolved by each instructor from experience with his own particular group of students.

A three years' trial of the case-teaching method in gynecology has convincingly demonstrated to me its value as an adjunct to other methods of clinical instruction. Perhaps the greatest proof of that value is the favor with which case-teaching exercises are received by students, for the modern medical student is, as a rule, very quick to discriminate between what is useless and what is profitable in his work.

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Vignes: The Etiology of Labor. Le Progrès médical, 1924, No. 35, p. 522.

After having discussed the various theories as to the cause of labor, Vignes, in summing up, states that although the onset of labor is attributed to fetal maturity, to the adaptability of the uterine muscle to contraction, or to the developing property of the decidua to separate, these factors are in reality only signs of ovular maturity and do not explain the etiology of beginning labor. He concurs with Avienne that at the appointed time labor begins by the "Grace of God."

Theodore W. Adams.

CARDIAC STIMULATION BY MASSAGE AND ADRENALIN FOR SUSPENDED ANIMATION, WITH THE REPORT OF A CASE

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THE employment of adrenalin, as a cardiac stimulant, seems to be practiced universally. Heart massage is performed occasionally, but, according to the literature, is a rather rare occurrence. In the case reported here, both methods of stimulation were used, and with such gratifying results, that a report seems justified.

Functional activity of the mammalian heart may be restored by the following methods which have been demonstrated either experimentally or clinically. Stimulation by: (1) *handling* or touching; (2) *needling;* (3) *aspiration* of the heart cavities; (4) direct cardiac *electrization;* (5) direct *arterial infusion* through the carotid toward the heart; (6) *heart massage;* (7) direct *injection of adrenalin* into the heart. Some of these methods have been discarded because of the attendant danger and doubtful value.

In suspended animation of the heart, the muscle, though relaxed, is capable of contraction if stimulated. But, as the arterioles and capillaries are entirely relaxed, it has been shown that it is extremely difficult to raise the blood pressure to a higher level than 15 or 20 mm. This level of pressure is incompatible with life. The problem therefore, is to increase the peripheral resistance, and this may be brought about by the injection of the blood pressure raising principle of the suprarenal glands. The solution (adrenalin) may be injected directly into a vein or it may be given intravenously with normal saline. It may be injected directly into the heart muscle or into one of the chambers of the heart. Intracardiac injection is the most prompt and powerful form of heart stimulation known. It is said that this method of stimulating a failing heart (intracardiac injection) was first used about fifty years ago by Schiff, a German physiologist.

Adrenalin stimulates the cardioaccelerator and augmentor fibers, thereby increasing the force and frequency of the heart beat. These two factors lead to an increase in the blood pressure. It has been demonstrated that adrenalin, applied to blood vessels as long as one hour after death, causes contraction. Now if the solution is injected into the blood and can be distributed, peripheral resistance should result. By proper massage of the heart, the circulation, and hence the distribution of adrenalin, is increased. The blood pressure is increased in the various arteries, and when the pressure in the coronary artery reaches 30 mm. or more, the heart will probably resume its rhythmic contrac-

tions. Keen points out that it is easier to reestablish the rhythmic action of the heart than to resuscitate the vasomotor and respiratory centers.

Bardier and Stillmunkes succeeded, with intracardiac injections of epinephrin, in reviving dogs that had succumbed to chloroform poisoning. Gottlieb found that adrenalin, given to animals poisoned with chloral, maintained the action of the heart until the danger point had been passed. Kathe obtained similar results in animals in collapse after excessive doses of chloroform. Kathe and Duncan used adrenalin in collapse following spinal anesthesia with stovaine and cocaine. Four cases were reported: In two the heart sounds were inaudible, and in two the respiration had failed. All recovered. Kathe gave a weak solution intravenously. Duncan gave four (4) minims of the 1:1000 solution intramuscularly.

Massage is of no value (1) after coagulation of the blood in the heart has taken place, (2) after the myocardium has lost all contractility by postmortem changes, and (3) after complete cessation of activity of the respiratory and vasomotor centers, as evidenced by arrest of respiration and an extremely low arterial pressure.

Direct cardiac massage may be applied by one of three procedures: (1) Sternocostal or transthoracic route (thoracotomy), (2) Abdominotransdiaphragmatic route (laparotomy and incision through the diaphragm), (3) Abdominosubdiaphragmatic route which accomplishes all that can be expected of any method without the risks and bad effects that other methods might produce. Obviously then, it is the method of choice.

Technic.—An epigastric incision is made. The hand is inserted and grasps the heart through the thin relaxed diaphragm, taking care to not injure the latter by perforation. The heart is held as well above the apex as possible so as to contract the ventricles rhythmically, 20 to 40 times a minute, between the thumb and fingers. The massage, if effective, should be continued until the heart beat is regular and forceful.

In cardiac massage, it is evident that rapidity in instituting the procedure is necessary. It has been said that "restorative measures are never exhausted or completed in such an accident (collapse under anesthesia) unless direct cardiac massage has been tried." In some cases the response is immediate, while in others no contraction has been felt until five minutes or more have elapsed. Lemormant reported 25 cases in which he used the sternocostal route 16 times with 12 total failures, three temporary recoveries and one permanent recovery.

CASE REPORT

A colored, unmarried woman, 38 years of age and a laundress by occupation, was admitted to the Emory University Unit of Grady Hospital on February 5, 1923, complaining of foul vaginal discharge of one year's duration, and backache of intermittent severity.

Past History: "Has never been healthy," has had "female trouble" for the past ten years. Right lobar pneumonia six years ago. Influenza three weeks ago. There were no complications. Menstruation began at 13, periods normal until two years ago at which time they became "scanty, irregular and watery." She had some pain during the last two periods. She has never been pregnant. She had "bladder trouble" about eighteen months before admission to the hospital and a recurrence of it in October, 1922. She has had nocturia as far back as can be remembered. *Operations:* An enlarged cervical gland was removed four years ago. Bartholin's abscess incised two years ago. Posterior colpotomy one year ago.

Present Illness: Since October 1921 she has been troubled with backache, especially when standing. For two months, preceding admission, she has had a dull headache, and for the past three weeks has slept very little. About one year ago she had severe pains in the lower abdomen. An abscess was opened and drained through the vagina. Following that operation she remained in bed about four months and has never been well since. She has had a foul, purulent, vaginal discharge continuously since the abscess was drained. On admission tenderness was noted in both lower quadrants, with a soft fluctuant mass, about the size of a grape fruit, low in the abdomen and slightly to the left of the midline. This extended into the culdesac. A foul purulent discharge was observed draining through a small opening in the posterior vaginal wall. Temperature 99°; pulse 100; respiration 20. The urine and blood, including the Wassermann test, were all negative. A diagnosis of chronic pelvic abscess was made.

The temperature and pulse rate dropped to normal immediately after admission, but it was thought wise to enlarge the opening into the culdesac and secure better drainage. This was done on February 8, 1923 and about 5 ounces of foul pus were evacuated. Free drainage continued and, except for a slight reaction to the operation, she remained afebrile until the twentieth postoperative day. At this time the temperature rose to 103° and the pulse to 130. The discharge ceased. It was thought that the temperature was due to the absorption of toxins from the abscess and therefore the opening in the culdesac should be enlarged. This was done; drainage was reestablished and the temperature and pulse rate promptly dropped to normal. Her blood was reexamined, but no remarkable change was noted. On the thirty-third day the discharge stopped again. There was an immediate rise in the temperature and pulse rate. The abscess was reopened with subsequent return to normal of the temperature and pulse rate. At this time, however, it did not appear that the patient was getting any better. She was draining freely from the culdesac, and the temperature and pulse were normal, but the impression was that she was getting gradually weaker and the wise thing would be the performance of a laparotomy and attempt to remove completely, the abscess mass.

On the forty-sixth day (March 26, 1923) under ether anesthesia, the abdomen was opened by midline incision. The entire pelvic cavity was found to be a mass of adhesions. The uterus was enlarged to half again its normal size and was soft and boggy. The left ovary had undergone cystic degeneration with no evidence of normal ovarian tissue remaining. There was a left intraligamentous cyst about the size of an orange. It was freed from adhesions and removed with the uterus. The right ovary was in the culdesac and was simply a sac of pus almost as large as the intraligamentous cyst. It was found that this mass alone (i.e., the right ovarian cyst) had been opened by the colpotomy incision. This mass was ruptured by the manipulation, and on removal a large amount of foul thick pus escaped. The intestines had been packed off and the soiled area was sponged out following the escape of the pus. The uterine arteries were being ligated when the patient suddenly ceased breathing and the heart stopped beating. When the pulse and respiration were reestablished, blood vessels were quickly ligated and the cervical stump was suspended from the round ligaments. One Penrose drain and one tube drain were brought out through the abdominal incision and the abdomen rapidly closed.

At the beginning of the anesthesia, the patient was extremely nervous, pulse 100, strong and regular. Blood pressure, systolic 158, diastolic 100. About one hour after beginning anesthesia, the pulse suddenly became imperceptible, but in one minute's time it was found to be strong and regular at 130 a minute. About thirty minutes later she was breathing regularly, 24 to the minute, pulse of good volume at 130 a minute and the pupils equal in slight contraction. Suddenly, and for the second time, the pulse became imperceptible; breathing ceased and heart impulse could neither be seen, heard nor felt. Both pupils were completely dilated. The patient's head was quickly lowered. Artificial respiration was begun and the sphincter ani was dilated. Two c.c. of adrenalin chloride (1:1000 sol.) were injected into a superficial vein of the neck and 2 c.c. were injected into the pericardial sac. The right hand was introduced through the abdominal incision into the abdomen, and the apex of the heart seized through the unopened diaphragm. No impulse could be felt. Grasping the heart between the thumb and fingers, as high up on the organ as possible, it was rhythmically squeezed. After four minutes of suspended animation, a faint cardiac contraction was felt. This was followed by rapid trip-hammer-like throbs, weak at first, but gaining in force as the rate slowed down to rhythmic beats and the pulse was perceptible in the temporals. At this time, cardiac massage was discontinued, but artificial respiration was kept up. About two minutes after the cardiac impulse was felt, the patient gasped and oxygen was given. Artificial respiration was discontinued and she promptly stopped breathing. The artificial respiration was immediately resumed and continued until the breathing was regular. Leaving it off the second time, the respiration continued at a regular rate and the pulse was 150 to the minute. One pupil was contracted to pin-point size and the other remained fully dilated. (Cerebral embolus was suspected). Oxygen was continued until the abdomen was closed. The patient was returned to the ward with a pulse rate of 140 and of fairly good volume; the right pupil dilated and the left, pin-point. The pulse rate soon came down to 132 and eight hours later she reacted. At this time both pupils were equal.

For nineteen or twenty days following the operation she appeared to be very sluggish mentally. Feeding was more or less forced. The mental sluggishness cleared up in about three weeks and she stated that she had no recollection of anything that had happened since she was taken to the operating room and anesthetized. Evidently the deprivation of blood to the brain (during the period of suspended animation) had lasted long enough to cause changes in the cerebral mechanisms concerned in memory and the higher mental processes. At the time of her dismissal from the hospital, she had a ravenous appetite, good morale, walked about the ward and felt all right. At the present time (1926) she is enjoying excellent health.

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436 PEACHTREE STREET.

VACCINATION OF PREGNANT WOMEN AND NEWBORN INFANTS

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THROUGH a ruling of the Department of Health of the City of Detroit, all patients presenting themselves at the Prenatal Clinics; and also all patients admitted for delivery at the Herman Kiefer (Municipal Obstetrical) Hospital, are routinely vaccinated against smallpox. By the same rule all newborn infants are also vaccinated.

The question has been raised, "Can an unborn infant be immunized against smallpox by vaccinating the mother during her pregnancy?" If so, another question arises as to whether a mother, who has been successfully vaccinated within the past three years, can transmit this immunity to her unborn child. If the immunity of the mother can be transmitted to the child, then as her immunity wears off, the unborn child ought to become more susceptible in proportion to the time that has elapsed since the mother was last successfully vaccinated. Again, in contrast, does vaccination of the mother during pregnancy or immediately previous, actually convey any immunity to the child in utero? Or is the immunity, that a certain proportion of newborn infants have, just a part of the general immunity which they offer to all infection?

With the material of the prenatal clinics available, and inasmuch as the cases coming to the prenatal clinics eventually deliver at the Herman Kiefer Hospital, it was thought opportune to check on a series of 351 cases delivered in the service during the months of July, August, and September of 1926.

It is generally conceded that pregnant women may safely be vaccinated without any untoward effects, and without fear of complications. As early as 1903 LeLievre (quoted by Urner) advocated the vaccination of pregnant women in smallpox epidemics; and today this is done as routine in many clinics (Urner at Minneapolis), especially during smallpox outbreaks.

The series of 351 cases herein reported were all vaccinated on entrance to the Herman Kiefer Hospital. All but 31 of these had been vaccinated at some previous time in their lives. These cases were all in labor or at term when admitted. Regardless of how recent their scar (274 having been vaccinated during pregnancy at the prenatal clinics), all were vaccinated. Fresh vaccine was used and the scarification method employed was the "scratch" method, three horizontal scratches about 3 mm. long and 1 mm. apart crossed by two vertical

scratches. The preliminary preparation of the skin consisted of washing with green soap, alcohol, and a final cleansing with distilled water. At the hospital as well as at the clinics, readings were made on the eighth day and all negatives were revaccinated. The date of the last previous positive vaccination was also recorded for future reference. Of the cases in which there was a positive reaction, 5 per cent evidenced symptoms of malaise, elevation in temperature, backache and discomfort. In not a single case was there any evidence of any threatened abortion, miscarriage, or premature labor.

All of our newborns were vaccinated with fresh vaccine on the first day. Here again the "scratch" method of scarification was used, the left deltoid being the area of choice except in a few instances of female infants where the mothers preferred the thigh region. Readings were made on the eighth day and all the negatives were revaccinated. In 14 cases there was a positive following a negative reaction, this being attributed to faulty technic.

The normal well-being and progress of the infant appeared unaffected, even though many severe local reactions occurred. In only

TABLE SHOWING THE NUMBER AND TYPE OF REACTIONS OBTAINED IN VACCINATING MOTHERS AND INFANTS

GROUP	LAST POSITIVE VACCINATION	MOTHER'S PRESENT REACTION		INFANT'S PRESENT REACTION	
	YEAR	POS.	NEG.	POS.	NEG.
I.	1926 1925	0	80	57	23
II.	1924 1923 1922	19	96	60	55
III.	1921 1920 1919	3	20	14	9
IV.	1918 1917 1916	3	13	8	8
V.	1915 1914 1913	2	9	5	6
VI.	1912 1911 1910	2	6	3	5
VII.	1909 1908 1907	3	4	5	2
VIII.	1906 1905	1	2	1	2
IX.	Prior to 1905	1	5	4	2
X.	Never Vaccinated Before	25	6	30	1
XI.	Vaccinated Before with No Take	15	36	38	13

one case of the entire series did a vaccinia occur characterized by typical exanthema. This infant recovered promptly. The temperature curves remained relatively unaffected, even though severe reactions occurred. Von Reuss, quoting Behm, Gast, and Wolff, calls attention to the absence of inoculation fever. Ablass, quoted by Klotz, explains this lack of temperature rise due to an immunity to the vaccine; whereas Mensching claims this to be a part of the normal physiologic thermal regulation property of the newborn. Klotz has also called attention to the relative infrequence of glandular swellings in the newborn. Our experience coincided with this.

The accompanying table gives the results of the series of vaccinations of both mothers and infants. The column to the extreme left indicates the year in which the last previous positive vaccination occurred. It will be noted that there were 80 mothers in 1926 with positive vaccinations, these having been vaccinated during their pregnancy. Of this group, 57 infants, or 71 per cent, reacted with positive vaccinations indicating failure of transmission of immunity from the pregnant mother to child. From 1926 back, the years are grouped in threes for convenience in tabulating and also assuming that a vaccination ordinarily gives an immunity for a three-year period. Group 2 consisted of 115 mothers of which number 19 reacted with positive vaccinations; and of this group 60 infants, or 52 per cent, were positive. From thence on the table indicates as to what the reactions were. Group 10, in which the mothers had never been vaccinated, showed a positive for infants of almost 100 per cent.

Immune reactions in the mothers were classified in the negative group. In the infants, no immune reactions occurred, the result being either a definite positive or negative.

Although the series of cases is small, yet several conclusions can be drawn from the results obtained.

CONCLUSIONS

1. Vaccination of the mother during pregnancy resulting in a positive reaction does not convey any specific immunity to the unborn infant, inasmuch as 71 per cent of the infants react with positive scars.

2. The immunity which is evidenced by the remaining 29 per cent is probably due to the general immunity which newborn infants possess, plus error from technic and poor virus.

3. Any immunity which is present is not sufficient to afford any protection, even from vaccination.

4. Previous positive vaccinations in the mother with repeated negatives following, although indicating an immunity to the mother, do not convey any immunity to the infant.

5. Women may be vaccinated with safety at any period of their pregnancy.

6. Newborn infants may be vaccinated on the first day after birth without undue symptoms and without any dereliction to their future welfare.

7. In clinics, routine vaccination of mothers and infants is advisable both for protection and for spreading civic health propaganda.

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1507 HOLDEN AVENUE.

THE VALUE OF THE BLOOD SEDIMENTATION TEST IN GYNECOLOGY

CONCLUSIONS FROM 250 CONSECUTIVE CASES

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THIS investigation was undertaken in order to determine whether the blood sedimentation test offers additional information either of diagnostic or therapeutic value. Although the test was suggested over one hundred years ago, it received no thorough clinical study until recently. The fact that the earliest clinical applications were in obstetrics and gynecology has probably no real meaning and the general principles indicated in relation to infection may well hold a similar value in other fields of medicine. The condition in which increased sedimentation rate occurs *par excellence* is sepsis, and our most rapid rates occurred when there was incarcerated pus. Pelvic abscess cases showed consistently the most rapid rates, while septic abortions, with equivalent febrile and leucocytic reactions but presumably without collections of pus, were definitely slower.

We have watched with much interest the results of the reaction of blood sedimentation in a practically consecutive series of 250 gynecologic cases of all types, correlating the leucocyte count, the febrile reaction, and the clinical response of the patient, with the blood settling time. In these observations it was attempted to determine whether or not rapidity of blood settling, as such, might be of prognostic value as well as being of some diagnostic importance in gynecologic pathologic studies.

Technic.—The simplest technic possible was employed. A stand containing 10 glass Linzenmeier tubes, each with a diameter of 5 mm., having an upper mark to indicate at what height the tube contains 1 c.c. and a second mark which is always 18 mm. below the upper one. First 0.2 c.c. of sodium citrate are placed in the tube. This is used in a 5 per cent solution. We place 0.8 c.c. of blood in the prepared tube, mix thoroughly, and note the time. The sodium citrate prevents the coagulation and a sinking of the red cell level below the upper mark is soon noted, leaving a column of yellowish-green plasma. The stand must be kept in exactly vertical position and at average room temperature. Keeping it in the icebox, we obtain almost the same results as in room temperature, but if it is kept in the incubator a highly increased speed is produced. As the speed is not constant but becomes slower in the lower part of the tube on account of increased density of the solution, a reading is taken when the red cell level has reached the lower mark 18 mm. from the upper one. Then the time is noted again.

A normal rate was established on healthy young women as a control. In a certain proportion the white blood count was also available as an additional check. This showed the typical wide variation within the presumably normal limits ranging between 248 and 630 minutes, averaging 446 minutes in 17 individuals. Values in men, being between 503 and 810 minutes, averaged 673 minutes. We have no explanation for the disparity between the sedimentation rates of the sexes.

Results.—Observations are reported upon cases of acute and chronic inflammatory disease of the pelvis, upon pregnancy and its complications, and upon benign and malignant neoplasms as well as upon uncomplicated uterine displacements.

TABLE I, PELVIC INFECTIONS

	NUMBER OF CASES	SEDIMENTATION TIME (MINUTES) RANGE	SEDIMENTATION TIME (MINUTES) AVERAGE	WHITE BLOOD COUNT RANGE	WHITE BLOOD COUNT AVERAGE	TEMPERATURE RANGE	TEMPERATURE AVERAGE
Pelvic abscess	15	5-30	16	21,000-9,000	18,000	39.2-36.9	38.2
Acute purulent salpingitis	40	12-66	26	27,500-4,500	11,000	40.0-36.9	37.7
Chronic inflammatory disease	40	58-240	151	15,800-5,100	9,200	37.5-36.6	37.2
Infected abortions	5	30-65	42	22,500-11,300	17,100	39.2-36.9	38.5

These cases were of the most interest to us because the febrile reaction and the degree of leucocytosis are constantly used as an index of the time for operation for the individual patient. Our lowest readings (i.e., always below thirty minutes, in one case even decreasing to five minutes) were obtained with pelvic abscesses which were usu-

ally associated with a definite elevation of temperature and leucocytosis in excess of 15,000. Pelvic abscess averaged sixteen minutes.

Cases with acute purulent salpingitis but without large abscess cavities also gave rapid sedimentation rates. Many of these were afebrile and had no leucocytosis, i.e., under 10,000 W.B.C. The latent infection thus is betrayed by the sedimentation rate and it may be the only sign that the patient has serious pelvic disease which requires attention, if the vaginal examination is equivocal. In our experience operation is not absolutely contraindicated, in the absence of fever and leucocytosis, when the sedimentation rate is very rapid, but it is safe to say that the speed of the sedimentation, the activity of the infectious process and the postoperative morbidity have a definite relationship. An increasing sedimentation rate may, however, be the signal for intervention for the evacuation of pus if the condition of the patient suggests that operation is preferable to expectant treatment. Subsiding salpingitis shows reduction of the rate, which changes very rapidly if any exacerbation occurs.

On a small series of desperately ill patients shown by autopsy or blood culture to have an overwhelming systemic infection, we found the sedimentation rate to be increasing or maintaining its rapid level whether the leucocyte count was high or low. It is noteworthy, however, that in cases of a large pyosalpinx or pelvic abscess with thick wall wherein the patient showed only a slight elevation of temperature and a white blood cell count ranging from 10,000 to 15,000, the sedimentation rate was quite as rapid as in cases of the flushed toxic patient with a tremendous leucocytosis and a high temperature. Repeated examinations of patients showing the most rapid rates of sedimentation gave no fluctuations which were of any prognostic value whatever.

The great proportion of cases with the most rapid rates, i.e., ten to thirty minutes as against the normal standard 248 to 630 minutes, made a prompt and entirely satisfactory recovery following surgical intervention (completion of abortion, pelvic puncture or salpingectomy). Three cases dying of sepsis of pelvic origin showed sustained rapidity of sedimentation on the day of exitus. From our results, therefore, the rate of sedimentation gives no information whatever whether or not the disease process is necessarily to be a lethal one.

In a series of 40 cases of purulent salpingitis where there was a gross purulent inflammatory disease in the tubes, the sedimentation ranged between twelve and sixty-six minutes and was above thirty minutes in only eight. The 20 cases in Table II are quoted to illustrate the consistency of the reaction in purulent salpingitis.

Chronic pelvic infections (salpingitis and parametritis) gave values between 75 and 255 minutes for complete settling of the erythrocytes in a series of 40 cases. These all were afebrile and all white blood

TABLE II

NO.	SEDIMENTATION TIME	WHITE BLOOD COUNT	TEMPERATURE
1	21 min.	7,580	38.0
2	20 min.	9,200	38.8
3	19 min.	11,100	37.2
4	26 min.	18,000	37.3
5	44 min.	8,500	37.4
6	27 min.	13,000	37.6
7	15 min.	9,500	36.6
8	30 min.	7,650	38.6
9	17 min.	------	37.0
10	15 min.	10,800	37.0
11	28 min.	6,800	39.0
12	29 min.	10,400	37.2
13	22 min.	9,800	37.0
14	36 min.	9,200	38.2
15	17 min	14,650	40.0
16	20 min.	13,300	37.4
17	32 min.	11,800	37.0
18	19 min.	18,800	38.0
19	13 min.	27,500	38.2
20	23 min.	14,700	37.6

cell counts were below 10,000. The blood settling time was reduced to an extent which we learned to interpret as typical of chronic inflammation, i.e., chronic metritis, salpingitis, ovaritis and appendicitis. Acute appendicitis in a very early stage gives a slower elevation from the normal than salpingitis of the same grade, which would indicate that the size of the lesion is perhaps a factor, salpingitis in its incipiency involving a greater tissue area than appendicitis.

In infected abortions the speed was uniformly increased, but was not always consistent with the temperature elevation and the white blood cell count. Typical sedimentation values ranged from sixty to twenty minutes. Postoperative phlebitis has in several cases given very rapid sedimentation, values ranging from twelve to forty-three minutes.

PREGNANCY

The sedimentation rate in 10 cases of normal pregnancy which we had the opportunity to examine fluctuated between 128 minutes at two months to 11 minutes at the eighth month. The test was originally applied to the diagnosis of pregnancy (Fahreus[3]). The increased speed, however, is not striking, in our experience, until the diagnosis of pregnancy is unmistakable by vaginal examination. Unruptured ectopic pregnancy gave rates between 251 and 286 minutes, which is without value from diagnostic standpoint. The test may occasionally be of value in differentiating the symmetric myoma from the pregnant uterus. A myoma, provided there is no degeneration, should cause little increase in speed, while the increase is fairly striking in a four to five months' pregnancy. There is also a definite increase at menstruation, the time varying between 160 and 256 minutes in a series of 5 normal women.

NEOPLASMS

1. *Myoma.*—Uncomplicated myoma gave a slight increase in sedimentation speed, ranging from 175 to 270 minutes in 10 cases, in average 215 minutes. These cases showed leucocyte counts within normal limits and were without exception afebrile. Degenerated myomata in afebrile cases with normal white blood counts showed markedly increased rates. This point is of value in the application of radium where degeneration of an otherwise uncomplicated myoma is suspected. This is in accord with Linzenmeier's results, who found myomata varying between 60 and 246 minutes. A rapid sedimentation with a myoma is an indication for immediate operation as it signifies probable necrosis of the tumor.

2. *Nonmalignant Ovarian Tumors.*—In six cases we found sedimentation reactions of normal range when they were not complicated; eight cases with ascites and adhesions showed increased rapidity, which corresponded roughly to the degree of peritoneal irritation as shown by thickening and formation of plastic adhesions and exudation of fluid.

3. *Carcinoma.*—The speed of sedimentation was increased uniformly in malignant neoplasms, the sedimentation being most rapid when the tumor is rapidly growing or giving rise to metastases or when it is breaking down. After radiation in cases of carcinoma of the cervix with regression of the tumor and amelioration of the symptoms, the sedimentation rate slowed markedly, approaching normal readings. Average time in carcinoma was forty-one minutes in 15 cases, ranging from twenty-two to sixty-seven minutes. It is of interest that in cases of cervical erosions and ectropion requiring frozen section to rule out malignancy, the sedimentation time was invariably in complete accord with the microscopic diagnosis, being 70 minutes or below in malignancy and above 150 in cervical erosions.

ANATOMIC VARIANTS (UTERINE DISPLACEMENT WITHOUT LESION)

Upon 16 patients with prolapse, relaxed vaginal outlets, retro- or anteflexion or retroversion of the uterus, normal sedimentation rates ranging from 240 to 463 minutes were obtained, provided there was no other pathologic change present. Our attention, however, was called to the presence of latent inflammatory disease in an apparently uncomplicated retroversion when low rates were found in several cases.

CONCLUSIONS

1. The velocity of the sedimentation of the erythrocytes gives information of value in establishing the diagnosis when considered in relation to the entire clinical manifestation.

2. The velocity of sedimentation does not indicate the patient's resistance to infection and is not of demonstrated prognostic value.

3. When there is neither fever nor leucocytosis, the velocity of sedimentation may aid materially in the diagnosis of suppuration in the pelvis.

4. In spite of exceptions the velocity of sedimentation is generally directly proportional to the extent or severity of the inflammation or both.

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BENIGN UTERINE BLEEDING: A PRELIMINARY REPORT*

By Joe Vincent Meigs, M.D., Boston, Mass.

(From the East Surgical Service, the X-ray Department, and the Tumor Clinic of the Massachusetts General Hospital)

THIS report deals with a few interesting and unusual cases of benign uterine bleeding seen at the Massachusetts General Hospital during the last three years and presents certain suggestions concerning the underlying causes of menorrhagia and metrorrhagia. It makes no attempt to deal with the usual causes of uterine bleeding such as fibroids, acute inflammations, polyps, senile atrophies, and malignant diseases.

Some of the cases are isolated and may not prove to be frequent, but represent types that have been studied in this clinic. Many of them seem to interlock one with the other, but there is something distinctive about each of them. There are cases under such headings as hypothyroid, hyperthyroid, thrombopenic purpura hemorrhagica, atypical purpura hemorrhagica, endocrine, and cases with no definite pathologic findings.

As slight variations from the normal in the condition of the blood may be very important, a person especially trained in hemocytology is essential in the clinic. The same is true of the endocrine aspects of the work.

The report also attempts to show that uterine bleeding is not as simple as once believed. Various workers have made definite suggestions of causes other than simple hyperfunction of the ovaries or hypertrophy of the endometrium.

*Read before the Obstetrical Society of Boston, Jan. 18, 1927.

HYPOTHYROID TYPE

Mrs. F. W., aged 39 years, had been under observation in the Out-Patient Department for a year for severe uterine bleeding and given various sorts of medical treatment without success. She was then studied further in the hospital and the only definite findings were a basal metabolism of minus 17 and a secondary anemia. This was on Feb. 16, 1924. She was curetted and the pathologic examination showed hypertrophy of the endometrium. To check the bleeding 50 mg. of radium were placed in the uterine cavity in a rubber catheter for twenty-four hours. She had at this time none of the characteristics of myxedema and the low metabolism was taken to be simply a low normal. When next seen in the Out-Patient Department her bleeding had stopped and she felt very well. A metabolism test was repeated and found to be minus 27. On April 21, 1924, two months later, it had dropped still more and she was sent into the hospital for study of her then very apparent myxedema. Later under thyroid extract therapy she again menstruated, but her periods have been irregular and scanty.

The above case, although the only one as striking in this series, suggests that perhaps there is a very definite association between a hypersecreting ovary and a hypofunctioning thyroid. It suggests that the ovary in some way compensated for an abnormally low thyroid secretion and that in consequence of the hypersecretion of the ovary the patient had menorrhagia. When the overactivity of the ovary was checked myxedema soon developed. This raises the question as to the importance of the ovary as an organ of internal secretion and seems to point out that conservation may be very important. Probably a few cases of hypothyroidism or even myxedema have been created by their removal. It led to a basal metabolism test being done on most of our benign uterine bleeding patients and to a more intensive search into the relation between the various types of thyroid disease and the menstrual cycle. It aided the belief that patients with uterine bleeding may have metabolic rates lower than normal and those with high metabolic rates may have scanty or no periods.

A number of cases seen in the thyroid clinic with hyperthyroidism had amenorrhea. Some had no change in their menstruation, but enough showed definite abnormality to warrant a study of this group.

Certain patients, following operation for toxic goiter, who have amenorrhea, regain their normal menstrual cycle as a result of the operation and the return of the metabolism to normal.

HYPERTHYROID TYPE

A patient in this group, D. N., aged 36 years, had always had normal periods every twenty-eight days and flowed for four or five days. She had had nose bleeds preceeding her periods since the age of fourteen. Following an operation on her perineum she had bled a great deal. She developed hyperthyroidism and this apparently caused no change in her menstrual flow. In the hospital the bleeding time was four and a half to five minutes on many occasions, the platelets were always less than normal and often spoken of as individually large. The coagulation time was 14.5 minutes. After many consultations it was decided to operate upon her for hyperthyroidism. Her metabolic rate had reached plus 40. It is possible that a partial cause for the increased metabolism might be due to

her secondary anemia. The operation consisted of removing about five-sixths of her thyroid gland. Four hours later it was necessary to reopen her wound and resuture. Two days later the wound was again reopened because of a large hematoma and resutured.

One month later her periods had increased in amount and Dr. Arlie V. Bock, associate physician to the Massachusetts General Hospital, wrote as follows when asked to see her in consultation: "This patient falls into the group of atypical purpura without thrombopenia and without change in the blood except for a coagulation time of twenty minutes and with some increase in the bleeding time. She has no history of spontaneous purpuric spots in the skin but has all the rest of the picture. She might respond to deep x-ray therapy over the spleen which should be tried out first before other measures."

High voltage x-rays were given over the spleen in September, 1925, and her October and November periods were normal. Later the uterine bleeding became more severe and in January, 1926, a series of deep x-ray exposures over the pelvis produced an artificial menopause. The patient dates the onset of new difficulties from this series of x-ray treatments, and although her periods stopped she was far from well, complaining of weakness, tired feeling, aching pains, sleepiness, lack of reaction to low temperature, and hot flushes. Her metabolism, June 5, 1926, was minus 12 and later was reported as minus 25. She developed a real myxedema and with thyroid extract has been made to feel perfectly well again. Her periods have never returned.

This is another very interesting case in somewhat the same category as the first. It is difficult of interpretation, but as Dr. Bock suggested in a later consultation the bleeding might be of endocrine origin. Perhaps the high metabolism was due to thyroid disease and partly the anemia. On removal of the gland it is possible that more was removed than was warranted by the real thyroid disease present and consequently the ovary began oversecreting with resultant menorrhagia. Then this hypersecreting ovary was checked by x-rays with a later fall in the metabolism to the level of the thyroid tissue remaining and a real myxedema developed.

This adds another case to those showing the close connection between the thyroid and the ovary, and if the above interpretations of the two cases are in any way true, it demonstrates that destruction of ovarian tissue should be avoided wherever possible.

The return of the patient's periods to normal for two months after the high voltage x-ray exposures over the spleen certainly warrants further study of this form of treatment in "atypical purpuras" as suggested again below. Perhaps she did not have amenorrhea during the anemia and hyperthyroidism as might have been expected because of the "atypical purpura," and thus the bleeding she did have was really pathologic.

Also another "atypical purpura" is added to the ever increasing number.

THROMBOPENIC PURPURA HEMORRHAGICA

A girl aged fourteen years, (L. E.) who had been in the hospital previously with thrombopenic purpura hemorrhagica, and who had had four transfusions to stop nasal bleeding, started flowing three months before readmission and did

not cease until her hemoglobin was 35 per cent. Her blood platelets were "very low." The bleeding time was ten minutes and clotting time five minutes, with a poor clot retraction at the end of four hours. Another test gave the bleeding time as forty-five minutes. Transfusion and splenectomy were done and two days later the platelets and bleeding time were normal. Her uterine bleeding stopped almost at once and her periods have been regular and normal.

Here is a very definite case of purpura hemorrhagica with few platelets, long bleeding time, short coagulation time and poor clot retraction. The uterine bleeding is to be attributed without question to the disorder of the blood. This case well illustrates the necessity of a very complete blood study in all cases of bleeding from the uterus without obvious cause.

"ATYPICAL PURPURA" TYPE

A patient (V. R.), aged 34 years, with a diagnosis of "atypical purpura" hemorrhagica made on long coagulation time, history of purpuric spots and a palpable spleen, had long continued uterine bleeding. She was treated with a series of high voltage x-ray exposures over the spleen and a cessation in the abnormal bleeding was noticed in about six weeks. This suggested in cases of "atypical purpura hemorrhagica" a trial of x-ray treatment over the spleen before resorting to splenectomy or before destruction of the function of the ovaries to stop the uterine bleeding.

Another patient (F. T.), aged 34 years, had had long and frequent periods for fourteen months before admission. The blood was not markedly abnormal, but Dr. Arlie V. Bock on seeing the patient in consultation wrote the following of her history and blood study on June 16, 1925: "The only history of bleeding in this woman appears to be from the cervix and the uterus. She has had no nosebleeds, no black and blue spots, or bleeding following tooth extraction. Her prolonged coagulation time and bleeding time suggest physical alteration of the blood and it may be that her bleeding is from the cervix because of slight disease there. The blood smear is normal. She may have purpuric bleeding and in view of the results of two recent cases I should feel it worthwhile to give a course of x-ray treatments over the spleen and see if a therapeutic result is obtained before resorting to surgery * * * * *."

Her metabolism was normal. Her curettings showed hypertrophy of the endometrium. X-ray treatment over the spleen did not check her flow and so she was given a series over the pelvis. This caused a cessation of her periods. During her stay in the hospital, and for some time afterwards, she was questioned very carefully as to the appearance of petechiae or black and blue spots, but she always denied their presence. She had had no uterine bleeding since the x-ray treatments. Her cervix was amputated later for chronic endocervicitis and no excessive hemorrhage or bleeding was encountered, although her bleeding time was sixteen minutes and the smear showed reduction of platelets. A letter from her a few months after the cessation of her periods, however, stated that she had noticed fifteen to twenty black and blue spots on the inside and outside of both her thighs, and that there had been no injury to her thighs to cause them. She reported later at the Tumor Clinic and her observation was verified. She had about twenty small black and blue spots about ¼" to ½" in diameter scattered over her thighs.

These cases suggest that perhaps there is a definite group without true thrombopenic purpura hemorrhagica, but with an abnormal type of blood showing slightly prolonged bleeding time, or poor clot re-

traction, a long or short coagulation time, perhaps a palpable spleen or simply a definite history of purpuric spots appearing on the person that may enter into the cause of uterine bleeding. Here again it became necessary to do very complete blood studies. It is also of great importance to inquire into the spontaneous appearance of petechiae or black and blue spots, and to ask whether the patient noticed that following very slight bruising she found them. This can be brought out easily in the history but must not be confused with a blow sufficient to cause an ecchymosis in a normal patient.

BLEEDING FOLLOWING RADIUM AND HYSTERECTOMY

This patient (R. W.), aged 33 years, had incontinence of uterine and retroversion. A plastic operation was done on the urethra and a suspension of the uterus. Following this she began to flow very severely. Intrauterine application of 50 mg. of radium for twenty-four hours relieved the bleeding for eleven months. Later examination showed the uterus to be symmetrically enlarged and the patient much distressed by uterine bleeding. A supravaginal hysterectomy was done, leaving both ovaries. The microscopic examination of the uterus showed an endometrium of a single layer of cells and in places no endometrium at all. She ceased bleeding for a short time, but it commenced again and a blood examination showed another "atypical purpura." X-ray exposures over the spleen were given without effect and as a last resort they were given over the pelvis.

This case suggested the great resistance occasionally of the ovary to radium and that the amount of endometrium present has but little to do with the hemorrhage and that there may be other factors in uterine bleeding besides the ovary and uterus. X-rays over the spleen were also ineffectual. Dr. Beth Vincent, visiting surgeon to the Massachusetts General Hospital, did not consider this case a suitable one for splenectomy as the diagnosis of true purpura hemorrhagica could not be made. He stated at this time that the patient suspected of purpura should have the blood examined during the period of acute exacerbation of the bleeding before a diagnosis of the blood condition could accurately be made. It is probable that the blood findings are cyclic and that one examination does not rule out true purpura hemorrhagica or the "atypical" type of purpura.

This patient is robust, healthy, and with normal metabolism, and her bleeding, except for the annoyance, is of no apparent harm to her well-being.

CASES WITH NO DEFINITE PATHOLOGIC FINDINGS

A patient (E. S.), aged 37 years, had flowed for four years. She had had two series of x-ray treatments in another hospital, which caused a cessation of her periods for a short time, but they began again shortly after the treatments. The curettings showed hypertrophy of the endometrium. Her metabolism was minus 5, and blood normal except for a slight secondary anemia. No definite or suggestive reason except the very slightly lowered metabolism could be found for her bleeding and so a supravaginal hysterectomy was done. The uterus appeared normal. The ovaries and tubes were left in place. She is now perfectly well,

without bleeding, change in the blood, history of purpuric spots or change in her metabolic rate.

A great many cases fall into this group and more work must be done to locate a reason for their flowing. In the above case the metabolism of minus 5 may possibly be a partial reason, but glandular therapy was of no avail.

OTHER ENDOCRINE TYPES OF BLEEDING

These included cases without any pathologic lesions in young girls and young women. Their curettings showed only hypertrophy of the endometrium. These patients have been treated with thyroid extract and corpus luteum, many with excellent results. Some have been improved permanently and others still find it necessary to continue the use of one or another of the gland extracts.

Another type of endocrine disturbance is represented by a young woman thirty years of age who had severe menstrual hemorrhages and headaches. Her metabolism on two occasions was found to be definitely above normal. She did not seem to be a toxic thyroid type. A roentgenogram of her head revealed a definite enlargement of the sella turcica. It is possible that her bleeding may be caused by a pituitary disorder.

CALCIUM

In consequence of the recent work of Dr. Joseph Aub and Dr. Walter Bauer on metabolism of the inorganic salts and the finding of greatly increased calcium output in exophthalmic goiter cases and a small output in myxedema cases, it seems fitting to study the calcium metabolism of cases of uterine bleeding and the calcium metabolism of the menstrual flow. Especially is this true as some of the cases have suggested that uterine hemorrhage may be accompanied by low metabolism and amenorrhea by high metabolic rates.

The work at the Massachusetts General Hospital is being done along the following lines:

1. Statistical study of menstruation and uterine bleeding in hypothyroid and hyperthyroid patients.

2. A careful history must be taken of any change in the patients' subjective feelings that would lead to a suggestion of lowered metabolism: such as coarseness and falling of hair, dry skin, use of more blankets than usual at night, dulling of mentality, general tired-out feeling, etc.

3. Study of thrombopenic purpura hemorrhagica in women as a cause of uterine bleeding.

4. Study of various variations from the normal in the blood of uterine bleeders.

5. Careful histories of cases with regard to the question of petechiae, black and blue spots and easy bruising.

6. Study of the question of x-ray therapy of the spleen vs. splenectomy in mild and severe purpura.

7. Study of calcium metabolism in uterine bleeding cases.

8. Study of cases with no known or even suggestive cause of bleeding.

9. Study of endocrine disorders and the use of endocrine therapy in certain cases.

10. Study of the pathology of uterine curettings to establish whether most hypertrophies of the endometrium are not simply normal menstruating endometrium and that the former diagnosis is only occasionally the cause of benign uterine bleeding.

11. A more careful study of slight variations from the normal basal metabolism with gland therapy based on the findings.

12. To determine whether or not other cases than thrombopenic purpura can be benefited by ultra violet light therapy of the sort recommended by Sooy and Moise (*Jour. Am. Med. Assn.*, July 10, 1926) and found by them to be apparently curative for cases of thrombopenic purpura hemorrhagica.

CONCLUSIONS

1. In the clinic at the Massachusetts General Hospital instances have arisen that seem to suggest that some cases of hypothyroidism or myxedema may have larger periods than normal and that in consequence of a poorly functioning thyroid ovarian hypersecretion may develop with consequent menorrhagia. Destruction of the hypersecreting ovary may show the picture in its true light, disclosing a real myxedema.

2. There have been cases of uterine bleeding in young girls held in check by the use of thyroid extract and extract of the corpus luteum and in one case hyper- or hypopituitarism seemed to be the causal factor.

3. It seems definitely established that hyperthyroid patients often have oligomenorrhea or amenorrhea and that removal of the hypersecreting gland may return the menstrual cycle to normal.

4. It seems definitely established that true thrombopenic purpura hemorrhagica is a cause of excessive uterine bleeding, and that there is a group of patients with slight variation from the normal in their blood picture, a history of petechiae or black and blue spots, and possibly a palpable spleen that have excessive uterine bleeding.

5. It also seems definitely established that there are other causes aside from the ovary and the uterus for benign menorrhagias and metrorrhagias.

286 Marlborough Street.

LICHEN PLANUS OF THE SEMIMUCOUS MEMBRANES OF THE PUDENDUM MULIEBRE

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THE eruption of lichen planus of the semimucous membrane of the pudendum resembles more that of the mucous membranes than that of the skin, and therefore may be even more characteristic of this disease than the cutaneous eruptions, and consequently may constitute a decided aid in diagnosis. This may be, in the individual case, an important matter. There is always the danger of confusing the eruptions of lichen planus with those of syphilis, and when situated on the genitals, this is greatly increased.

Lichen planus of the vulvar mucous membrane is, to say the least, infrequent, although probably not nearly so infrequent as its infrequent mention would indicate. Like lichen of the mouth it may not cause uncomfortable symptoms, and therefore the patient may not know of its presence, or knowing, may not draw the physician's attention to it, and the physician just as naturally does not look for it. Gynecologists must see the condition oftener than other practitioners, but they seldom mention it. They are not interested in it, it is out of their line of thought, and they regard it only when forced on their attention by the patient complaining of discomfort, or when it is thought to be a venereal disease, or when it causes marked deformity, as for instance, kraurosis.

Just as one may have lichen planus of the cheek pouches or tongue alone, so one may have a lichen eruption confined to the genitalia. For instance, a Greek woman, forty-two years of age, consulted us for severe pruritus vulvae. She had a milky white coating over the whole vestibule, with some of the characteristic white lacework at the posterior commissure, which was sufficient to confirm the diagnosis.

Another woman, thirty-nine years of age, was sent to us for diagnosis. She had three white areas on the semimucosa of the labia majora, first noticed about one month previously. There was a faint indication of papulation, and there was the characteristic lacework, dimmed by the overlying white coating.

The following is an instance in which the vulvar condition was accompanied by many more symptoms, by a more generalized lichen planus.

A woman, aged fifty-three, consulted us for "white spot" disease of the back of the neck, the extensor surface of the right forearm and over the front of the upper part of the chest. Besides this there were a number of large angular lichen

papules on the anterior surface of the right wrist. At a subsequent visit a few months later she drew our attention to the mucous membrane of the external genitalia. There was a thick leathery white coating over the whole vestibule, including the inner surface of the labia minora, and the meatus urinarius. There was a thick white coating also in the vulvo-thigh grooves, extending back along the perineum and including the anus. The mucous membrane of the vagina beyond the introitus looked and felt normal. The only itchy lesions were those of the genitals.

The labia majora were normal in size and appearance. The furrows between the labia majora and minora were slightly excoriated, and itched severely. The labia minora were elongated into large flat prominent flaps with a smooth leucoplasia-like surface that was particularly thick and white on the inner surfaces, and presented a white plaster-like patch to the right of the urethral opening. The prepuce was present, but the site of the clitoris was a sunken cavity, and there was no frenulum. The meatus was normal, pink, and the introitus was narrowed. During the time she was under treatment small numbers of typical lichen cutaneous papules made their appearance in different localities.

A very interesting feature of the case was that she should have two such rare manifestations of lichen ending in atrophy, such as the pudendal condition and "white spot" disease.

In this case we were witnessing undoubtedly a progressive atrophy of the pudendum muliebre, sometimes described under the name kraurosis.

The danger of confusion with syphilis is shown in one of our patients, who got a severe fright, thinking that her trouble was venereal.

She noticed two small white discs exactly bilateral, and situated one over the inner surface of each labium majus above the level of the clitoris. They had a strange weird appearance, like two staring eyes, and were quite startling to one who had a bad conscience, as our patient had.

Her trouble had begun two weeks previously on the forearms, where there were now some papules arranged in a linear manner. The whole dorsum of the tongue was covered by a white coating quite distinguishable from the usual coating from indigestion, and this coating almost extinguished a white lacework lying beneath it. Both cheek pouches were also occupied by the characteristic white lacework. There afterwards developed under the breasts a great many brownish red prominent papules with delicate linear marking on their top, as described by Louis Wickham. After some time the previously described pudendal white discs underwent a change. They became less white and two prominent lichen papules developed in the left one, corroborating their lichen nature. None of the lesions, either of the mucous membranes or of the skin, was accompanied by any subjective symptoms whatever.

The characteristic lesion of lichen planus is a small substantial papule covered by a thin scale, but one can have a lichen planus patch without papules, as for instance on the dorsum of the tongue, where it may occur as a white scarlike streak.

Recently a woman consulted us with an exquisitely itching area on the inner surface of the left labium minus that we regarded as being a patch of lichen planus. The woman was fifty-five years of age, thin, spare and faded looking, a true nervous type. To add to her nervousness she took too much tea and coffee. She was constipated and therefore flatulent, and to add to her flatulency she took too much easily fermentable food, such as sugar, potato, butter and cheese. All

of which probably contributed to her misery. Her menstruation had ceased after an operation on the fallopian tubes ten years previously.

The patch of which she complained was about an inch square, and a striking feature of it was that the upper border was in a straight line. The surface was finely granular and brownish red. There was no papulation and only a slight induration. The pruritus had begun twenty-five years previously, had endured for some time, had ceased, and had begun again in 1906. The attacks of itchiness were severe and exquisite, and reduced her to a desperate condition. There were, however, no scratch marks, and there was no marked desquamation or cross-hatching, as of lichenification. The striking objective features were the straight upper border, giving the lesion a square artificial appearance, and, as the redness faded under treatment, the remaining brown pigmentation.

Whenever an eruption has an artificial appearance, as in the well-known streaked forms in lichen, one should consider either the possibility of an artificial eruption, or lichen planus. In addition to this there was the pigmentation so frequent in lichen planus. As the impression of lichen planus became stronger, we finally examined the mouth to find a well-marked typical lichen eruption in the left cheek pouch opposite the last molars. There were the white papules, some of which were stellate, and the white lacework, some of the trabeculae of which were unusually thick.

There was now no doubt that the patient had lichen planus; whether the affection on the labium majus was a neurotic eczema would of course be discussable.

Treatment as for lichen planus was instituted with radium, a tar-lead lotion, and measures looking to the correction of the patient's general condition, which soon brought about a marked amelioration of the tormenting symptoms.

The foregoing indicates that the recognition of the true nature of a lichen planus eruption of the semimucosa of the female pudendum may be of great importance because of the alarm it may occasion owing to its startling appearance, and because it may be mistaken for syphilis. Like lichen of the mouth it may also furnish substantial aid in determining the diagnosis of a puzzling cutaneous eruption. The differentiation of this condition from leucoplakia may also serve to relieve the patient's and the physician's mind from the fear implied, even if not expressed, of cancer.

As for treatment, this is more often than not, disappointing. As in oral lichen planus, our two main drugs in this disease, mercury and arsenic, more often aggravate, rather than ameliorate, the symptoms, and the treatment is therefore usually nonspecific and contemplates measures looking to the general health of the patient.

323 Geary Street.

THE USE OF RADIUM IN THE TREATMENT OF ENDOMETRIOMA OF THE RECTOVAGINAL SEPTUM*

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A CONSIDERATION of endometriomata or adenomyomata of the rectovaginal septum from the standpoint of treatment, leads us to divide them into three groups.

Group 1.—Small tumors imbedded in the upper part of the vaginal wall, usually posterior to the cervix, to which they are attached but which do not involve the rectum. In rare instances, they are found to be isolated and discrete and freely movable with the vaginal wall.

If located posterolaterally to the cervix, we find them in the uterosacral ligament or extending into the base of the broad ligament. They vary in size from 0.5 to 1.0 cm. The smaller ones are usually globular. The contour of the larger ones becomes irregular through the development of nodules of various size.

Group 2.—To this group belong endometriomata of sufficient size to involve the supravaginal portion of the cervix, upper vaginal wall and anterior rectal wall but remain confined to Douglas' pouch. They have not extended laterally to surround the ureter, posteriorly along the ureterosacral ligament to invade the lateral walls of the rectum or outward along the broad ligaments to involve the uterine adnexae and other pelvic structures.

Through the medium of the growth the cervix, vaginal wall and rectum become firmly adherent to each other to form an irregular mass, which may attain the size of an egg.

Nodules can be palpated beneath the involved vaginal wall, which is usually puckered at the area of its attachment to the tumor.

Group 3.—This group includes the most extensive of the endometriomata originating in the rectovaginal septum. They involve not only the cervix, vagina and rectum, but invade the broad ligaments, surround and constrict the ureters, infiltrate large areas of the rectum, narrow its lumen and eventually glue together the pelvic structures into an immovable mass, reminding one very much of a massive chronic pelvic cellulitis.

The etiology and pathology of endometriomata have been thoroughly studied by Sampson and Cullen, who have presented their views in numerous communications.

*Read at a meeting of the Obstetrical Society of Philadelphia, November 4, 1926.

It would appear that not all the tumors of the rectovaginal septum are the result of implantation of endometrial cells regurgitated into the peritoneal cavity through the tubal canal during menstruation or which have escaped from rupture of an endometrial hematoma of the ovary. In some instances a direct connection between the tumor and the endometrium has been described, giving evidence of its origin in the uterine mucosa and subsequent penetration of the uterine wall.

Symptoms depend largely upon the size of the tumor and the involvement of the pelvic viscera. The tumors of Group 1 produce few, if any, symptoms and are usually discovered during examination for other diseases of the pelvic organs. The chief symptoms of Group 2 are pain and menorrhagia. Two types of pain are described: a grinding sensation in the lower abdomen and a distressing fullness or pressure in the rectum, aggravated during defecation. It is usually pronounced at the time of menstruation and is abated or even absent between periods. The exacerbation during the periods is ascribed to the swelling of the tumor, which is claimed by Cullen to occur in adenomyoma "no matter where situated."

Menorrhagia occurs in nearly all cases, either as a prolongation of the period or as excessive flow during a period of normal duration. Spontaneous bleeding from the rectum is occasionally present. Additional symptoms occur in tumors of Group 3 because of the pressure upon the ureters and pelvic nerves and the involvement of the tubes, ovaries, sigmoid, etc.

Constriction of the ureters produces unilateral or bilateral hydroureter with intrarenal pressure, especially during the menstrual periods.

The mode of treatment of endometrioma will greatly depend upon the size of the tumor and the degree of invasion of the pelvic structures.

Small tumors in the posterior vaginal wall whether discrete or adherent to the cervix are easily removed through vaginal incision.

The surgical attack upon the widespread endometrioma of Group 3 has consisted chiefly of its removal by painstaking and extensive dissection as has been so successfully done by Cullen in nine reported cases. Such operations necessitated occasional resection of the rectum, sigmoid and bladder.

Cullen, Graves, Keene and Sampson have observed regression in endometriomata involving areas of the rectum and bladder which were not resected at operations in which ablation of both ovaries had been performed. These results indicate that the activity of misplaced endometrial tissue, as represented by endometriomata, undergoes the same atrophic or regressive changes as normal endometrium when deprived of the influence of ovarian hormone. That such an effect upon adenomyomatous tissue is not uniform, however, is shown in

one case operated upon by Cullen in which the tumor had continued to develop following bilateral oophorectomy performed by another surgeon two years previously.

The question has been raised by Armytage, whether regressive changes in the tumor result from the destruction of ovarian activity by x-ray therapy. In the treatment of tumors of Group 2, whose removal through vaginal incision is rendered difficult and dangerous because of their adhesion to the rectum or of their situation in the uterosacral or broad ligament, we are confronted with the problem of attacking them either by the methods employed in the treatment of Group 3, or of attempting to destroy the activity of the endometrial cells of the tumor by implantation of radium.

If satisfactory results can be obtained by the latter method, especially in young women, it would seem to be the method of choice, since it is easily and safely applied.

Herewith I present two cases in which the application of radium proved very satisfactory.

CASE 1.—A. S., aged 27, was referred to me in April, 1918, by Dr. Solomon Solis-Cohen with the following history: Menstruation had begun at the age of 13 and had been regular and painless. She had a curettage four years previously for uterine discharge but it was only moderately successful. In January, 1918, she developed pain in the hypogastrium which spread to both iliac regions and confined her to bed for about three weeks.

There was distinct tenderness over McBurney's point. On bimanual examination both ovaries were found to be tender and prolapsed. On April 24 through a Pfannenstiel incision I found both ovaries prolapsed and adherent in Douglas' pouch by friable adhesions. The tip of the appendix was found adherent to the right ovary; the adhesions were broken up and the appendix removed. The operation did not afford her complete relief for she continued to suffer from bilateral iliac pain and in addition, a sensation of fullness and pain in the rectum especially before menstruation. On examination in January, 1921, I found that the ovaries had again prolapsed. The left one was distinctly larger than on the previous examination and there was some thickening of the left uterosacral ligament.

Another abdominal operation was done on January 25, 1921, when both ovaries were again found to be adherent in Douglas' pouch. The left ovary contained multiple cysts and was about three times its normal size. Almost all of the left ovary was removed. The right ovary was placed anterior to the broad ligament through a button hole incision and sutured in its new position. The thickening in the uterosacral ligament was examined, the peritoneal covering was puckered and it felt like an old cellulitis.

Unfortunately the patient continued to suffer pain in the rectum, accentuated just before and during menstruation. The mass in the uterosacral ligament had become somewhat nodular by October, 1921 and I decided that it was an adenomyoma. Its removal, through vaginal or abdominal incision, presented distinct difficulties and furthermore I was loath to recommend another operation. I decided to attempt its destruction by the use of radium. On October 12, 1921, under nitrous oxide-oxygen anesthesia, the cervix was grasped in a tenaculum and drawn to the right. An incision was made through the vaginal wall beneath the left uterosacral ligament, in which the nodule of adenoma was felt. Through

the vaginal incision six needles (each containing 12.5 mg. of radium) were introduced into the nodule. The radium was removed in six hours.

The patient remained under my obeservation for a few months after the radium treatment, during which time there was a vaginal discharge. The pain gradually subsided and the uterosacral mass decreased in size. I did not see her again until October 24, 1926, when she reported that menstruation had continued regularly, lasting two or three days. She has had no flushes or sweats; she feels better during menstruation than at other times and has had no return of the pain. On vaginal examination I found that with the exception of slight contraction of the left uterosacral ligament the pelvic organs were in good condition. It is interesting to note in this case that, in addition to the gratifying local results, the radium has not interfered with activity of the ovary or uterus as menstruation has occurred regularly.

CASE 2.—E. S., married, consulted me October 21, 1921 complaining of headache, nervousness, insomnia, severe dysmenorrhea and pain in the rectum preceding menstruation. She had had her appendix removed four years before. There was some tenderness in the right iliac region. On bimanual examination I found a flattened nodular mass adherent to the posterior vaginal wall, cervix and rectum. On inspection a rounded projection presented itself in the upper posterior vaginal wall. The diagnosis of adenomyoma of the rectovaginal septum was made and the use of radium advised.

I did not see the patient again until the latter part of October, 1925, when she told me that she had been operated upon in November, 1921. The removal of the right tube and ovary did not afford any relief. Examination revealed that the tumor had about doubled in size, but was still confined to Douglas' pouch and firmly attached to the surrounding structures. Radium was again advised and this time the advice accepted.

Under nitrous oxide-oxygen anesthesia on November 4, 1925 an incision was made in the vaginal wall through which four needles of radium, each 12.5 mg. were introduced into the tumor mass. The radium was allowed to remain in place twenty-four hours. The menstrual periods have continued regularly; the nervous symptoms have gradually diminished in severity; her general health has improved; she has gained twenty pounds in weight and the rectal pain has completely disappeared.

On examination October 15, 1926, I found that the tumor had markedly diminished in size and the nodulations had disappeared. In this patient we note again the continuation of menstruation after the use of radium and the complete subsidence of local symptoms.

I know of no published records regarding the use of radium in adenomyoma of the rectovaginal septum. In a private communication, Dr. C. Burnam gave me a record of three patients in whom radium was employed. In two of the patients the adenomyoma was recurrent after operation by Dr. Cullen. Burnam's results in the three cases were very satisfactory.

Judging from results, it would seem that there is a distinct field for the use of radium in the treatment of adenomyoma of the rectovaginal septum especially in those instances in which the tumor is not small enough to be easily removed through vaginal incision, and not so large that all of it cannot be brought under the influence of radium embedded within it. Its use in properly selected cases avoids the necessity for abdominal incision and unsexing the patient.

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REPORT OF A BENIGN GIANT CELL TUMOR OF THE XANTHOSARCOMA TYPE*

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THIS paper presents a brief résumé of what has been written regarding xanthoma, especially in reference to the question of malignancy, and to report one such case.

These tumors are so called because of their characteristic yellow appearance (Gr. xanthos), and they may arise in any situation in which endothelial and connective tissue is present. They are first mentioned by Rayer in 1856 in connection with yellow plaques of the eyelids. The name given to these tumors is probably due to Lebert, who in 1845 called the yellow fatty substance "xanthos."

Sir James Paget in 1856 preferred the term myeloid tumors, and he mentions the finding of large multinucleated giant cells. He found such tumors in the mammary glands, conjunctiva, subcutaneous tissue and bone. Hertaux in 1891 described myelomas of the tendon sheaths with some yellow areas which contained an ether-soluble fatty substance. Broders reported 17 cases of benign xanthoperiosteal tumors of the extremities, 16 cases of which were in the tendon sheaths. Carroll Smith reported cases occurring in the tongue, labium majus, parotid gland and the dura. Miller reported cases in the tendons of the foot, the breast, and in the bones of the skull, vertebra, and the extremities.

Clinically there are three varieties of xanthoma: (1) xanthelasma which occurs in the eyelids; (2) xanthoma multiplex which is seen in widespread lesions of the skin, and (3) xanthoma which occurs as

*Read before the Section on Obstetrics and Gynecology, Cleveland Academy of Medicine, Dec. 10, 1926.

isolated tumors in many parts of the body and to which a wide variety of names is given.

The reason for this yellow color has been widely investigated by Pinkus and Pick, Pringsheim, Pollitzer and Weil, Darier, Burns, Smith and others, and is stated by Miller "to consist of a cholesterol fatty acid ester which is doubly refractive to polarized light. In fresh tissue fixed in formalin the lipoid granules appear as small yellow globules, when stained with Sudan III, and assume a gray color with osmic acid. When fixed in alcohol they are readily dissolved and leave behind small vacuoles which appear microscopically like foam, and have given rise in the literature to the term 'foam cells' and 'xanthoma cells.' This lipoid substance is deposited in the tissue and acts as a foreign body which is absorbed by the endothelial and connective tissue cells, with the formation of multinucleated giant cells." In Garrett's opinion, the pigment remaining from the absorption of degenerated blood gives rise to the color, whereas Fleissig believes that blood pigment has no association with the color. Miller believes that the two pigments, carotin and xanthophyl, belonging to the group of carotinoids, when combined with the cholesterol esters (which themselves are colorless) give rise to the yellow appearance.

The association of these tumors with such pathologic conditions as cholesterinemia, lipemia, diabetes mellitus, and icterus, has also been studied by numerous investigators, including Pinkus and Pick, Pringsheim, Pollitzer and Weil, Darier, Burns and Smith.

From the study of early cases by Pinkus and Pick, Pollitzer and Weil, Macleod and others, it has been shown that the initial phase consists in a dilatation of the capillaries, a proliferation of the perivascular endothelium and a deposit within the tissue spaces of a finely divided lipoid substance which in later stages is absorbed by the endothelial and connective tissue cells as a foreign material. This gives rise to the formation of large polyhedral cells with small nuclei and granular cytoplasm and is accompanied by a reaction in the formation of large multinuclear foreign body giant cells and an active proliferation of the fibrous tissue.

The large polyhedral cells or foam cells under the high power show small vacuoles where the lipoid substance has been dissolved through the use of alcohol in the preparation of the slide. This is analogous to the giant cell formation which not uncommonly is found about cholesterin crystals, in the walls of ovarian cysts, in the corpus luteum and in other conditions in which cholesterin is present. Here also the cholesterin is dissolved by alcohol and radiating clefts remain surrounded by giant cells.

Are these tumors malignant? Tourneaux collected 93 cases of xanthosarcoma of the tendon sheaths. He believes these may grow very slowly and then show a sudden rapid growth, or may be malig-

nant from the start. In 21 of his cases there was a recurrence after local removal. Broders reported 17 cases of benign xanthoextraperiosteal tumors. Hertaux in 1891 considered myelomas of the tendon sheaths as benign, and Bellamy in 1901, because of the proliferation of the endothelium, called the tumors endotheliomas. Bloodgood in 1903 and 1905 classified these tumors as benign hemangiomas. Carroll Smith in 1912 believed the tumors to be benign and called them xanthomatous endotheliomas. Miller in 1924 very thoroughly reviewed the entire subject of xanthomata and concluded that by far the majority of tumors in which xanthomatous tissue is seen are benign in character and should be so treated surgically.

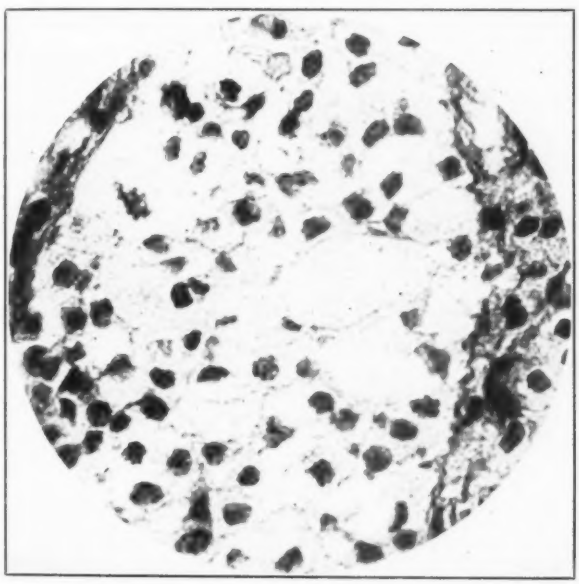

Fig. 1.—Giant cell tumor showing xanthoma or foam cells.

I wish to report one such case of benign giant cell tumor of the xanthosarcoma type occurring in the sacrum.

Mrs. A. B., aged 25, was admitted to Lakeside Hospital January 15, 1920. She had been married six months. The last menstrual period was January 2, 1920, and the previous period November 5, 1919. She complained of (1) backache for one month, less during the periods and worse on standing; (2) no menses in December; (3) slight dysmenorrhea at times; (4) slight leucorrhea for years. There was no history of menorrhagia, metrorrhagia or urinary disturbance. There were no symptoms of pregnancy. One grandparent died of cancer of the stomach and one of cancer of the breast. The previous history was negative.

The physical examination was negative except for tenderness and the presence of a firm mass about the size of an orange in the left iliac region. On vaginal examination the cervix was soft and pushed to the right. The fundus was forward, enlarged, globular and to the right of the midline. A tumor mass the size of a grapefruit could be separated from the uterus but was adherent to the

pelvic wall posteriorly. The lateral structures were small and freely movable. The diagnosis was pregnancy complicated by a subserous uterine fibroid, adherent to the sacrum.

Through a median suprapubic incision, the abdomen was opened and in addition to a pregnancy of two months, a retroperitoneal tumor about 10 cm. in diameter was encountered arising from the sacrum in the region of the promontory and extending to the ileum. The peritoneum over the tumor was incised and an attempt was made to shell out the tumor with its capsule. This was so intimately connected posteriorly that the capsule was ruptured and a large quantity of spongy yellow material escaped. Beneath the area to which the posterior portion of the tumor was attached there were two areas of erosion of the underlying bone. Although there had been very little blood loss, the patient went into shock and the operation had to be terminated quickly. The capsule was hastily dissected out but it was evident that not all the deeper portion of the tumor, where it involved the sacrum, had been removed. Early the following morning

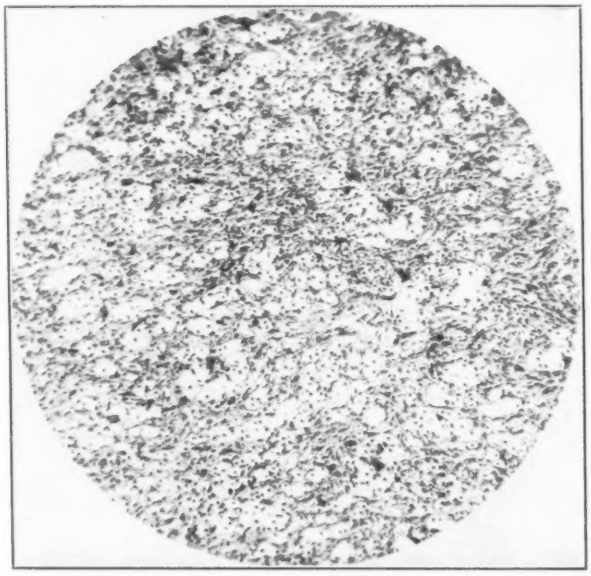

Fig. 2.—Giant cell tumor showing giant cells and diffuse infiltration of the fibrous tissue with xanthoma cells.

the patient aborted. Following her operation she convalesced rapidly and was discharged from the hospital February 4, 1920. On vaginal examination at that time a recurrence in the sacrum as large as an orange could be palpated.

The histologic examination by Dr. H. Goldblatt showed that the tumor consisted of moderately nucleated fibrous connective tissue infiltrated rather profusely with lymphocytes. In addition to the fibrous tissue there were in all the sections large collections of foamy cells, which were rather large, polygonal in outline, having very light staining vacuolated cytoplasm with small nuclei that vary in shape and stain densely with basic stain. Some of the sections stained with Sudan III showed that only these foamy cells took up the stain and took it up intensely. In some of these sections the foamy cells appeared to infiltrate the fibrous connective tissue. There were no mitotic figures. A moderate number of capillary blood spaces were scattered throughout the tumor. Several sec-

tions from this tumor were sent to Prof. J. Ewing of Cornell University for examination and he corroborated the diagnosis of sacral xanthosarcoma, retroperitoneal.

When the diagnosis was made x-ray therapy was instituted and the mass very rapidly subsided. For a time menstruation ceased but this has now returned. At present there is no evidence of tumor either by digital or x-ray examination.

I am indebted to Dr. H. T. Karsner for the accompanying microphotographs of this tumor.

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Operative interference for an ectopic pregnancy is always required because even after the death of the fetus the Langhans cells of the chorion will continue their cytolytic action on surrounding tissues. Secondary hemorrhages from further erosion might prove more dangerous than the primary hemorrhage. Also the hematocele, even if encapsulated, should be removed. The remaining hematocele furthers the development of adhesions which may lead to various dangerous sequelae. For operation only the abdominal route should be taken and all free blood removed from the peritoneal cavity. If the contents of the ovisac are infected the operation may be carried out in two steps, during the first step, the peritoneum is fastened to the sac, at the second, the mass is opened for drainage. The author's total mortality in 103 cases was 9.5 per cent, almost always the fatal result being due either to chronic septicemia or extreme anemia. From the Author's Abstract.

PORRO CESAREAN SECTION FOR POSTINFLAMMATORY DISPLACEMENT AND FIXATION OF THE CERVIX

By Robert A. Wilson, M.D., Brooklyn, N. Y.

(From the Department of Obstetrics of the Methodist-Episcopal Hospital)

THE following case is reported in some detail because a careful search of the literature has failed to reveal any other case with similar pathologic findings. In this instance not only was pelvic delivery impossible, but after delivery had been accomplished by the abdominal route the conditions encountered demanded further surgery. The end-result, after a careful follow-up, has fully justified the course of the surgeon at the time of operation.

Mrs. A. F., age 36, white, para ix, came under my care December 15, 1924. Her family physician believed her to be pregnant, but upon vaginal examination was unable to locate the cervix. An interview with the patient elicited the following interesting history:

She had enjoyed good health as a child and was married at the age of twelve. Menstruation began at fourteen, two years after marriage, was regular and never occasioned any discomfort. Her last period was May 5, 1924. She had her first baby when fifteen years of age, there were no complications and none of the subsequent pregnancies ever interfered with her health in any way.

Her present trouble began six years ago when she contracted an acute gonorrheal infection. An immense pelvic exudate developed, entirely filling the culdesac and extending for an indeterminate distance. Because of slow improvement, pain and disability, she entered St. Catherine's Hospital, Brooklyn, N. Y., March 17, 1919, and ten days later a posterior colpotomy was performed. Six weeks later a left salpingectomy somewhat improved her condition. For the next three years she was a chronic invalid, unable to take care of her home and October 5, 1922, was again compelled to enter the hospital for a third operation, which consisted of a left oophorectomy with the freeing of numerous adhesions. From that date until one year ago she required continuous medical care, suffering from lower abdominal pain, rectal tenesmus, nausea and general invalidism. In December, 1924, she consulted her physician stating that she believed she was pregnant. He expressed himself as being frankly skeptical, but examination revealed a fetal heart which confirmed her statement.

Because of her condition, severe pain, nausea and vomiting, she frequently contemplated suicide. She was admitted January 6, 1925, to the Methodist-Episcopal Hospital, Brooklyn, N. Y., on the service of Dr. R. M. Beach, in my care, for further study and in order to more effectually relieve her suffering.

Physical examination showed a woman about thirty-five years of age, pale and apparently suffering from pain in the lower abdomen. Heart and lungs were negative.

Abdominal examination revealed an old median hypogastric scar. The fundus uteri measured 32 cm. and was apparently contracting at short intervals. The fetal heart was normal.

Vaginal examination revealed a relaxed pelvic floor and a vagina which was greatly elongated and drawn upward apparently by traction from above. The cervix was very high and back of the pubis, irregular in outline, densely fibrous and firmly fixed by surrounding exudate. The lower part of the uterus also was

immobile with a development of the fetus almost entirely at the expense of the posterior uterine wall. The uterine pains which were occurring were apparently due to the efforts of the restricted uterine body to empty itself of its contents. The presentation and position could not be determined and a rectal examination revealed nothing more of interest. Her laboratory findings were entirely satisfactory, hemoglobin 70 per cent, Wassermann negative and the blood chemistry normal. Her blood pressure was 120/60.

A diagnosis was made of pregnancy complicated by an old inflammatory fibrosis, displacement and fixation of the cervix with a complete obliteration of its canal.

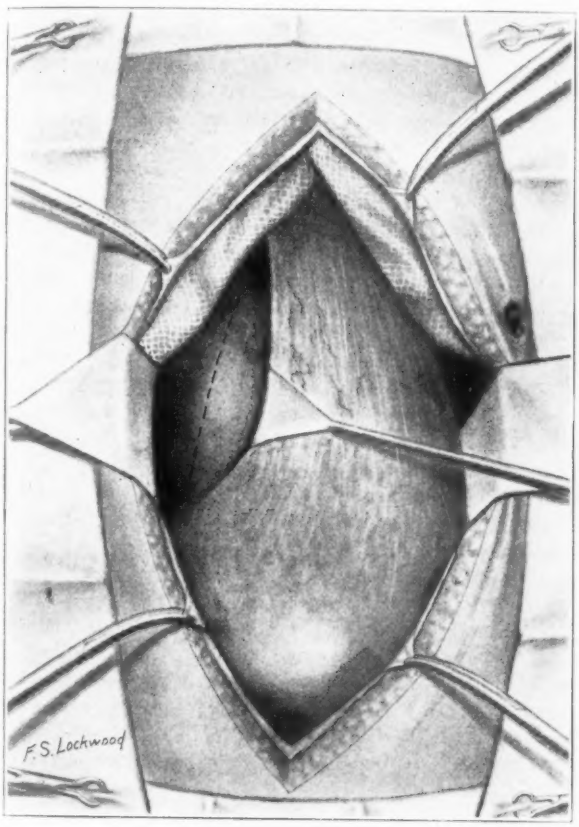

Fig. 1.—Bladder and bladder reflection covering anterior wall of uterus, and site of incision in uterus.

The recommendation was further observation, relief of pain, and an attempt to improve the patient's general condition until viability of the baby was assured, and this to be followed by a Porro-cesarean section for the following reasons:

1. To secure a live baby, as vaginal delivery was impossible.

2. To completely remove organs which were irreparably diseased and had caused marked disability before the pregnancy.

3. To remove the danger of defective drainage from the uterus, suture leakage and peritonitis.

The patient remained in the hospital for twenty-four days before operation, the pregnancy being estimated to be of 33 weeks' duration. An x-ray picture revealed

a baby of average size presenting by the breech. During this period the patient received an average of three hypodermics of morphine in each twenty-four hours, in order to alleviate the severity of the pain. Altogether she received sixty-seven hypodermics of morphine before operation.

The operation was performed January 30, 1925, the fundus measuring 35 cm. and the fetal heart being normal.

An incision was made to the right of the umbilicus, avoiding the old scars. The entire anterior surface of the uterus, up to the fundus, was covered with a thick, fan-like, adhesive band which was found to be the bladder reflection. Apparently at a previous operation, this had been sutured to the raw area left by the removal of the left adnexa and had been drawn upward by the growing uterus. The bladder also was drawn up with this band and could not be easily distinguished. An area on the uterus near the upper right lateral aspect was exposed by partial separation of this band, the uterus incised, and the baby extracted by the feet. The placenta being removed manually, the uterine cavity was packed with a laparotomy sponge and a running catgut suture was used to temporarily close the uterus.

The band was densely adherent all the way down the uterine wall; the lower segment of the uterus and the cervix firmly fixed by an old inflammatory exudate, extending down the left pelvic wall and involving the sigmoid. The entire cervix was immensely hard and thickened; the right tube normal and the ovary elongated and somewhat cystic. Apparently most of the growth of the uterus had been at the expense of the posterior wall although there was no marked sacculation or thinning. Despite the technical difficulties it was evident that if this patient was to be cured of her long-standing disability, a complete cleaning out of the pelvis with the release of all possible adhesions was absolutely necessary.

The fan-shaped bladder reflection was separated from the uterus down to the cervicovaginal junction, and a separation of all other adhesions accomplished without damage to adjacent structures. A large tenaculum was next inserted into the uterus and upward traction applied, which showed very clearly the extreme fixation of the lower uterine segment.

A typical supracervical hysterectomy was done, leaving only a small amount of cervical tissue which was completely peritonealized. It was now observed that the sigmoid was tremendously dilated, being so large that it filled the entire pelvis. This dilation was due to a low annular constriction apparently of inflammatory origin. The abdomen was now rapidly closed as her condition was only fair; pulse 160, respirations shallow, and color very pale.

The patient quickly reacted from the operative shock and was out of danger in a few hours. Her convalescence was uneventful; there were no complications and she was discharged from the hospital eighteen days after operation. Her general condition was excellent and she was free from pain for the first time in many years.

The baby at birth weighed only four pounds, but thrived under care and when discharged weighed six pounds, two ounces.

The wound healed by primary union.

The abdomen was flaccid and there were no points of tenderness.

Vaginal examination showed a transverse scar about 4 cm. long, situated about two-thirds of the distance from the introitus to the vault, drawn close behind the symphysis and representing the original site of the cervix. There was no fresh exudate and no discharge.

Rectal examination revealed a moderate constriction, about four inches above the anal opening, which was undoubtedly the etiologic factor in the production of the dilated sigmoid noted at operation.

Cystoscopic and proctoscopic examination was refused by the patient at this time, with the promise, however, to submit to the same at a later date.

This patient has been under my care since her discharge from the hospital, and at this time, February 1, 1927, enjoys excellent health and is completely free from pain.

I believe that the following recapitulation will bring out the interesting points in this case.

1. The possibility of a pregnancy would seem remote because of the original extensive pelvic exudate, requiring drainage of a subsequent abscess and two later operations on the left adnexa, and the extremely high, fixed and thick cervix.

2. For several years severe pelvic pathology incapacitated the patient. From the beginning of the pregnancy her symptoms were markedly aggravated and in the later months frequent doses of morphine were necessary to control the pain.

3. Vaginal delivery was impossible because of the condition and situation of the cervix. Abdominal section was the only means available to save the life of mother and child.

4. Operation revealed: (a) the uterus completely veiled by the bladder reflection which had to be partially removed before the uterus could be incised, (b) a sacculation and distention of the posterior uterine wall, which largely accounted for the continuous uterine contractions, (c) an annular constriction, of inflammatory origin, near the junction of the sigmoid and rectum, explaining its dilatation and the previous symptoms of partial obstruction.

5. In order to relieve the previous invalidism and to safeguard against defective drainage, rupture of the uterus and peritonitis, the uterus was removed.

6. The live baby and a well mother indicate that the proper surgical procedures were used.

557 THIRD STREET.

ANNULAR DETACHMENT OF THE CERVIX IN A CASE OF PROLONGED LABOR DUE TO A GENERALLY CONTRACTED PELVIS*

BY LEE DORSETT, M.D., F.A.C.S., ST. LOUIS, MO.

WITH the exception of a scant mention in various textbooks and a few scattered case reports, the accident herein mentioned is rare. It is classified either as spontaneous amputation of the cervix, circular amputation, or transverse rupture, and as I prefer to call it annular detachment.

The factors causing this condition are a contracted pelvis and a partial dilatation of the cervix in which the whole of the cervical canal becomes fully opened up with the exception of the os externum;

*Read before the joint meeting of the St. Louis and Chicago Gynecological Societies held in Chicago, December 4, 1926.

the fetal head under strong contractions descends into the vagina with the wall of the cervix stretched over it. In a case of contracted pelvis the cervix becomes wedged between the fetal head and the pelvis, edema begins, followed by thrombosis and necrosis, and lastly by sloughing. As there is generally more pressure anteriorly than posteriorly, the cervix is generally attached by a small band to the posterior cervical lip.

CASE REPORT

A colored primipara, aged 20, entered the St. Louis City Hospital, having rather weak and irregular contractions. She was at full term, the McDonald measurement being 35 cm. She had a generally contracted pelvis. The fetal head was not engaged and the membranes had ruptured previous to entrance to the hospital. The fetal heart sounds were located in the right lower quadrant. For the next twenty-four hours the contractions were still very irregular, but

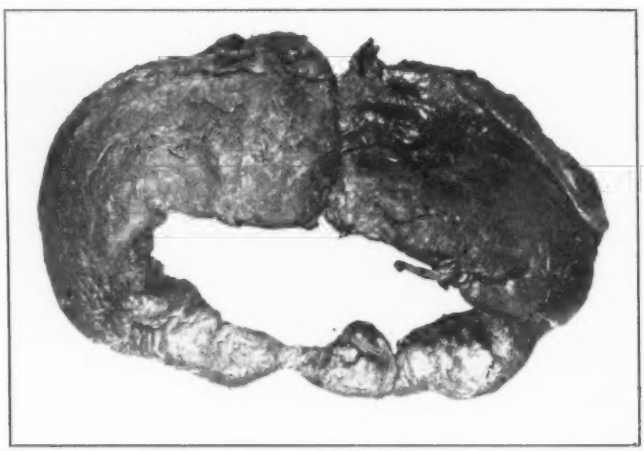

Fig. 1.—Detached cervix. The thicker portion is the posterior lip.

after this time became harder. The head entered the pelvis and she was in labor some twenty-four hours longer when the head was on the floor. It was then noted that there was a small bluish-black mass about six cm. long and four cm. wide protruding from the vagina. This mass was unrecognized at first. Vaginal examination showed that it was attached to the posterior lip of the cervix by a band 3 cm. wide and the diagnosis was made of an annular detachment of the cervix. The fetus was delivered by a rather difficult low forceps. It was stillborn and weighed 3270 gm. and the head showed marked molding, with a large caput.

After the placenta was expelled the cervix was exposed, and the partially detached band of the cervix was cut away from it. There was no postpartum bleeding. There was quite an extensive laceration of the perineum which was repaired and the patient was returned to her bed in good condition.

The patient ran a low grade temperature following delivery and had a persistent urinary retention with a severe cystitis. Vaginal examination ten days after delivery revealed no evidence of any cervix whatsoever, there being only a slit about 4 cm. wide in the vaginal vault which communicated with the uterine cavity.

1217 Missouri Building.

LONG STANDING GRANULOMA INGUINALE

By Floyd W. Rice, M.D., Des Moines, Iowa

THIS case is recorded because of its marked involvement and to add to the scant number of reported cases in the literature. The patient was very much below par mentally so the history had to be pieced together a little at a time.

Miss M. W., aged 56 years, walked into the Des Moines City Hospital (Broadlawns General) complaining of hemorrhoids, chronic diarrhea, and weakness. The hemorrhoids had been present for over two years, without soreness or bleeding, likewise a chronic watery diarrhea with incontinence of stool for nine months, which necessitated wearing a diaper, incontinence of urine for over a year without any

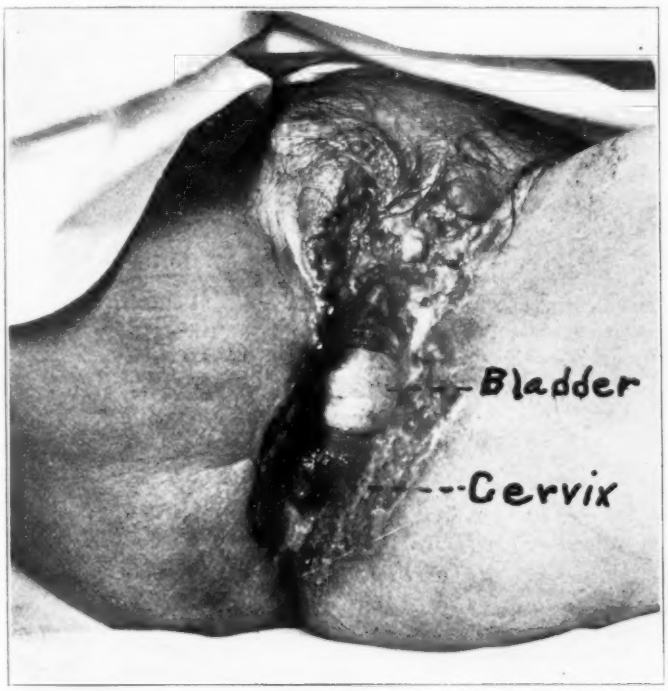

Fig. 1.

burning or soreness. A loss of ten pounds in weight occurred since the diarrhea started. Appetite was poor. She complained of no other symptoms whatsoever. There had been no pain at any time anywhere except the slight soreness in the groins.

She had had the usual diseases of childhood but no other illness except a bone infection in the left shin which was operated upon several years ago. She denied venereal infection, was unmarried and never had been pregnant.

Physical Examination.—She was an elderly woman, rather pale, apparently free from pain, undernourished, and unkempt. Her right eye contained a cataract; left eye reacted to light and accommodation. No evidence of infection. False teeth. Left axillary gland size of pea, inguinal glands size of almond. Large ulcerative area

with complete necrosis of all the vulvar structures, urethra, vagina, perineal body, levator muscles, triangular ligaments, coccygeus muscles and rectum with sphincter muscles up to Douglas' pouch. The walls of the ulcerated area were hard and indurated; did not bleed on touch, and were practically free from discharge. There was surprisingly little soreness.

Wassermann was negative to both alcoholic and cholesterinized antigens. Red blood cells 5,208,000. Hemoglobin 80 per cent, white blood cells 15,000 with 84 per cent polyps and 10 per cent eosinophiles. Blood sugar 0.11 per cent. Blood urea nitrogen 14 mg. The smears showed numerous Donovan bodies. The temperature ran from normal to slightly above until a few days before death when it dropped to 96° F. Owing to the absence of the urethra, urine examination was impossible. The ulcerated area was continuously bathed in urine and liquid stool.

The treatment consisted in trying as best we could under the conditions to keep the parts clean, and the intravenous administration of tartar emetic. This was started with one c.c. of a 1 per cent solution the first dose and doubled until 10 c.c. were given twice each week. At no time did she complain of any reaction to the drug. There was decided improvement beginning the second week, scab formation being noted in the periphery. We were absolutely unable to check the severe watery diarrhea. The patient became progressively weaker, the temperature dropped to 96°, and she died January 5, 1927, from exhaustion.

Autopsy Report.—(Wm. Saunders, M.D.) The liver showed bluish gray in color, not abnormal in size. Gall bladder full of gallstones. Kidneys: congenital lobulation of both; small retention cyst at upper pole of right. Pelvic organs: All atrophic; no pathology. Chest: Hypostatic congestion of lower lobe of right lung. Heart: very thin wall of right ventricle. Otherwise not abnormal. Aorta: Intima of arch shows a few superficial areas of yellowish discoloration. There was an enormous necrotic, ulcerated area involving all the external genitalia and the perineum, extending from the symphysis to the coccyx, with total destruction of the vagina and rectum up to Douglas' culdesac.

1118 EQUITABLE BUILDING.

Green-Armytage: Obstetric Teaching—A Live Method. Journal of Obstetrics and Gynaecology of the British Empire, 1924, xxxi, 218.

The author urges the use of live babies in mannekin teaching. Covering the baby with a sheet, pelvic and abdominal examination becomes a matter of live interest to the student. Version, breech, and forceps extraction are easily done on the live baby, the instrument blades being tipped with rubber. Gentleness of manipulation is required of the student from the start and is not left to be acquired later. By the aid of diagrams showing the fascial supports of the uterus the student learns the dangers of forceps application before complete cervical dilation or engagement of the head. By placing the baby in a bag, the upper end of which has been cut away, students are taught the methods of induction of premature labor. All procedures are done in a warm room, the mannekin properly warmed and lubricated, and a competent instructor is always on hand to insure careful handling of the baby.

H. W. SHUTTER.

A CASE OF FIBROMYOMA OF THE VAGINA

By C. B. Ingraham, M.D., Denver, Colo.

FIBROMATA or fibromyomata of the vagina are comparatively rare. Graves[1] states that less than two hundred have been reported, yet the possibility of their presence must be considered when a swelling appears in this region. They may be mistaken for hernia, Gärtner's duct cyst, müllerian cyst (a blind supernumerary vagina), rectocele, or malignant growth.

Fig. 1.—Solid tumor of vaginal anterior wall.

Fibromyomata in this situation arise from smooth muscle and connective tissue of the vaginal wall, a pure fibroma is uncommon. It may be that they are aberrant from the cervix and situated in the vesicovaginal septum or have a pedicle extending into the parametrium, in which case, there is some question whether they should be properly classed as vaginal tumors.

They are most commonly found on the posterior vaginal wall, are usually small, with a polypoid or sessile development and they are prone to undergo degeneration with sloughing and infection, occasionally becoming malignant. Littauer[2] reports an instance of serious hemorrhage from the tumor.

These growths are well defined and at operation readily shelled out. Adenomyomata, on the contrary, are intimately attached to the surrounding tissue and necessitate dissection. Adenomyoma containing glands with and without cystogenic stroma are described and supposed to arise from vaginal glands or the wolffian duct. Adenomyomata observed in the rectovaginal septum, are the type of growth described so fully by Cullen.[3] They enlarge during the menstrual period and are said by Sampson[4] to be implantation adenomata of endometrial type.

The case here reported occurred in my service at the Colorado General Hospital; a married Jewish woman thirty-nine years of age, who had had three children, no miscarriages, and normal menstrual periods with the exception that the flow has been more profuse of late.

She had been told by a physician three years previously, that there was a tumor in the vagina, but promptly "forgot all about this until a year later when there was discomfort accompanying intercourse." A year ago she herself found, on digital examination, a lump on the anterior part of the vaginal wall. At that time it was not large enough to protrude but during the last six months it has increased rapidly in size and has prolapsed when she has been on her feet. There has been no discomfort or symptoms other than frequency and desire to urinate.

The pelvic examination showed a moderately relaxed vaginal outlet, on the anterior wall of the vagina a soft cystic feeling tumor 6 by 7 cm. situated between the urethra and cervix. This could be replaced within the vulva and on straining, or with traction, made to protrude and resemble a cystocele. The cervix, uterus, and adnexa were normal.

At operation, the tumor was readily enucleated; running from the tumor at its upper pole, was a narrow strip of tissue about 2 mm. in diameter, which resembled the tumor in structure and went in the direction of the cervix; this was so friable that it broke a few millimeters from the growth and was lost. It gave the appearance of being a pedicle about the size of a piece of string, and as if the fibroma had originated in the cervix uteri and worked its way down into the vesicovaginal septum.

The pathologic report was made by F. E. Becker, M.D.

The section showed approximately equal amounts of smooth muscle tissue and degenerated connective tissue. The smooth muscle consists of interlacing bundles, normal in appearance, with well staining nuclei. The connective tissue fills the spaces between the interlacing bundles of muscle, was very loose, contained few nuclei and few, but quite distinct fibrils in a homogenous base.

The section grossly described as consisting of mucous membrane with a small amount of underlying tissue shows on microscopic examination, normal vaginal mucous membrane and a rather dense connective tissue layer. *Diagnosis:* fibromyoma with a myxomatoid degeneration of the connective tissue element.

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(1) *Graves:* Textbook of Gynecology, W. B. Saunders, 1923, p. 316. (2) *Littauer:* Centralbl. f. Gynäk., 1902, xxvi, 1406. (3) *Cullen, T. S.:* Johns Hopkins Bull., Nov., 1917. (4) *Sampson:* Am. Jour. Obst. and Gynec., Nov., 1925, x, No. 5, p. 649.

509 Republic Building.

REPORT OF TWO CASES OF MALIGNANT NEOPLASM OF THE OVARY. TREATMENT BY RADIATION*

By A. W. Jacobs, M.D., New York

THE majority of the malignant neoplasms of the ovary are carcinomatous and present a difficult problem in therapy. In general, results from surgical measures alone are not very encouraging. It is possible that by some combination of surgical and radiotherapeutic procedure better results may be obtained in producing palliation of symptoms and a prolongation of life.

A recent study of fifteen cases of carcinoma of the ovary which I made at the Montefiore Hospital during the ten-year period from 1914 to 1923 inclusive, showed the following: married 13, single 2; youngest 22, oldest 80. Age periods: 22 to 30, 3 cases; 31 to 50, 5 cases; 51 to 60, 6 cases; 80, 1 case; showing that about 70 per cent occurred between the ages of 31 and 70. Ascites was present in 11 cases, hydrothorax in 3 cases. The total duration varied from 5 to 42 months. Most of the patients living over twelve months and up to forty-two months were past the age of forty. The total duration in three individuals aged 58, 60, and 80 was 36, 36, and 42 months, respectively, which apparently suggests a better prognosis in the number of months in the older women. The average total duration of life during the period from 1914 to 1921 inclusive, without any special therapy, was twelve months; while the average duration in 1922 to 1923, when Roentgen therapy was instituted, was twenty-three months.

Case 1.—J. E., a woman aged 28, was referred August 24, 1925, with the following history: Married four years, one child living and well, 3 years old; no miscarriages. Menstruation started at thirteen years and was regular, and normal. After the birth of her child three years ago, she became markedly constipated for about a year, then improved until one year ago when she again became constipated and had to resort to cathartics. Commenced to lose weight in January, 1925, and lost about twenty pounds in a year. Had no pain but on account of the constipation consulted a physician, who upon examination established the presence of a pelvic tumor, which was confirmed by several physicians. The diagnosis was fibroid uterus.

Abdominal examination revealed a hard mass in the suprapublic region. On vaginal examination there was a hard irregular mass in the posterior culdesac.

At operation by Dr. Rongy at the Lebanon Hospital, in June, 1925, there were papillary masses on the anterior surface of the uterus involving the bladder wall, metastases in the glands and peritoneum, also a large hard retroperitoneal mass. The condition being considered inoperable, a specimen was taken for pathologic examination, and the wound was closed. Microscopic report was papillary adenocarcinoma of the left ovary with metastases.

*Presented at a meeting of the Society of Alumni of Lebanon Hospital, March 8, 1927.

About six weeks after operation, the patient was referred to me for deep Roentgen therapy, which was begun August 24, 1925. She received a series of treatments to the pelvis; four fields 15 x 15 cm. each, anterior, posterior, and lateral, at 50 cm. distance, 200 K. V., 4 M. A., filtration 0.5 mm. cu. and 1 mm. Al, 30 minutes each, and repeated.

Examination of the patient by Dr. Rongy about two months after treatment was instituted showed her to be gaining in weight, appetite good, bowels functioning without the aid of cathartics, and diminution in the size of the masses in the abdomen. He advised a repetition of the series of Roentgen treatments, which was given in December, 1925.

Her last menstrual period was September 29, 1925, three days' duration, and she has had no period since. The patient has been attending to light household duties, and was without symptoms until November 5, 1926, when she appeared again for treatments, which she received only partially, as she failed to present herself for the completion of the series. A report from her physician about two weeks ago states that she is beginning to have symptoms again, which may necessitate a repetition of a series of treatment.

It is now about eighteen months since this patient was referred to me for therapy, and apparently the condition has been controlled, with palliation of the symptoms.

CASE 2.—A. C., woman aged 51 years, was admitted to the Lebanon Hospital December 11, 1925, her chief complaints being abdominal pain, flatulence, and backache. She had been married twenty years, and never been pregnant. Menstruation commenced at sixteen, regular, and normal. For the past year her periods were irregular, occurring every two-and-a-half to three months, and lasting three days. Last period six weeks before admission. Medical history is negative. Operation for cervical adenitis at the age of seven. Cholecystectomy and appendectomy at the Mt. Vernon Hospital five years ago. The onset of the present illness was two weeks, with pain in the abdomen radiating to both lower quadrants and to the flanks. Relieved by standing, aggravated by sitting or lying on the left side. Constant backaches and a feeling of pressure on the rectum with passing of an abnormal amount of flatus. No bleeding or leucorrhea, but for the past year the menstrual periods have occurred at intervals of two to three months. Nocturia and dysuria for the past two weeks.

The positive findings on physical examination were: general appearance emaciated and evidence of loss in weight. The abdomen was distended by a large mass about the size of an egg-plant, located mainly on the left side of the abdomen extending beyond the midline over the right side. The mass was tender at all points, especially on the left side, soft and doughy in consistency, not fixed in position, regular in outline, and dull on percussion. On vaginal examination the mass was palpable in the left fornix. Roentgen examination of the chest was negative. Roentgen examination of the abdomen showed a mass in the pelvic region, which extended to the level of the fourth lumbar vertebra, with the shadow more prominent on the left side, with upward displacement of the intestines, suggestive of a pelvic tumor. Blood examination showed Hb 70 per cent, W. B. C. 11,200, P. 80 per cent, L. 20 per cent, B. P. 140/90. Blood Wassermann and blood chemistry were negative. Urine negative. The preoperative diagnosis was ovarian cyst.

At operation December 15, 1925, the omentum was much thickened, adherent at all points, and particularly over the bladder region. The entire pelvis was a mass of firm adhesions. The large cyst behind the symphysis was freed, being ruptured in the process and about a pint of dark serous fluid escaped. A specimen from the omentum was taken for pathologic examination and the wound closed. Pathologic report gross and microscopic was normal fatty omental tissue, no evidence of tumor formation.

Except for slight postoperative fever, the patient had an uneventful recovery, and was discharged from the hospital January 10, 1926.

On January 30, 1926, the patient was readmitted to the Lebanon Hospital complaining of frequency of defecation and urination, pain in the lower abdomen and vomiting, beginning two days after she left the hospital. No hematuria or melena. Ten days later, began to have dull pains in the lower abdomen with feeling of pressure, which were not constant. Vomiting for three days of greenish fluid. Complains of feeling weak.

Examination revealed a semihard mass extending from the pelvis to about one and a half inches above the umbilicus, not tender. Flat on percussion. On vaginal examination, a soft mass was palpable. Diagnosis was papillary cystadenoma of the ovary.

Oophorectomy was performed by Dr. Rongy and radium implantation by me on February 11, 1926. Low median incision of the abdomen, encysted bloody fluid found, left ovary contained a papillary cystadenoma, which was removed. Bare tubes of radium emanation were inserted into the base of the stump, and adjacent peritoneal coverings, a total of twenty-nine (six to the left, fourteen to the right, and nine in the cyst wall), and three drains were inserted.

Microscopically the ovary showed cystic degeneration of papillomatous masses with diagnosis of papillary cystadenoma. In spite of the pathologic report, clinically this case was considered as a malignant neoplasm.

The postoperative course was uneventful except for a temperature reaction up to 102° for several days after the operation. The general condition improved, and the patient gained in weight and strength. On March 8, 1926, the blood examination showed Hb 68 per cent, R. B. C. 3,900,000, W. B. C. 8,000, B. P. 165/90. At this time, the patient was transferred to the New York City Cancer Institute for further treatment.

Examination on March 11, 1926, by Dr. I. Levin, revealed an irregular nodular mass fixed and immovable in the lower right quadrant of the abdomen, slightly tender. There was a shifting dullness in the flanks. On vaginal examination, a mass was palpable in the right fornix, with the left fornix only slightly involved. The patient received high-voltage Roentgen treatments to the pelvis, and was discharged from the hospital, improved, on April 24, 1926.

Examination of the patient on March 8, 1927, showed her to be in good general condition, gained in strength and weight from 119 at the time of her discharge from the New York City Cancer Institute to 155 pounds. She attends to all her duties and is symptomless. Has had no menstrual period for about fifteen months. Examination of the abdomen revealed a hard mass fixed in the lower right quadrant, not tender nor painful. It is now over a year since operation and implantation of the radium, and the patient is symptomless, with the condition apparently controlled.

CONCLUSION

In malignant neoplasms of the ovary, Roentgen therapy can produce a palliation of symptoms and a prolongation of life. Generally the surgeon and the gynecologist are pessimistic in the management of these conditions, although it is possible that by the proper cooperation with the radiotherapist better results can be obtained in the future.

40 West Seventy-Second Street.

REPORT OF A CASE OF SEPTICEMIA FOLLOWING A SACRAL ANESTHETIC*

By Lyman S. Hall, M.D., Nashville, Tenn.

(Assistant Resident in Gynecology and Obstetrics, Vanderbilt Hospital)

MRS. D. B. was admitted to the gynecologic service at Vanderbilt University Hospital, January 26, 1927. Her general physical condition was good and she presented a relaxation of pelvic floor, prolapse of posterior vaginal wall, chronic endocervicitis (nonspecific), and retroversion of uterus.

On the third day of her hospital stay the following operative procedures were carried out: Sacral anesthesia, dilatation and curettage, cauterization of cervix, perineorrhaphy (Polak's technic), anterior suspension of uterus, (Olshausen's method).

The sacral anesthetic failed to work and general anesthesia was resorted to.

The following day the patient complained of severe pain to the left of the sacral hiatus. She had some nausea and vomiting and her temperature rose to 104° F., pulse 130 and respiration 24. On the morning of the second day her temperature was 101°, pulse 120, and respiration 22. Her condition seemed slightly improved. Late in the afternoon her temperature rose to 104°, pulse 180 and respiration 32. Her pulse was quite thready and her condition serious. To the left side of the spine from the sacral hiatus to the lower angle of the scapula was an area of marked induration and slight crepitation. This was quite tender and very painful. She continued to vomit and the emesis was now almost pure bile. On the morning of the third day her temperature was 101.5°, pulse 130, and respiration 24. She continued to vomit bile, her condition was becoming worse, and she was quite jaundiced. A gastric lavage was done and the vomiting lessened. She was also given normal saline, subcutaneously, and digifoline. The area in her back remained about the same as on the previous day. The perineal and abdominal incisions were in good shape. She was typed for a blood transfusion and early in the night was given 460 c.c. of whole blood by the direct method. The blood of the donor and recipient were both type 2 and cross-matched perfectly. The patient was better for about 30 minutes after the transfusion, and then complained of being cold and showed signs of weakening. She soon lapsed into unconsciousness and died about three hours later. Her temperature shortly before death was 108°.

On admission the urine was negative, red blood cells 3,450,000, white cells 8400, hemoglobin 63 per cent. On the second postoperative day the urine showed albumin two plus, sugar negative, and microscopic examination revealed both red and white blood cells. White blood cells were 17,000, and hemoglobin 61 per cent. On third postoperative day red blood cells 3,208,000, white cells 16,200. A blood culture obtained on the third day revealed numerous colonies with definite zones of hemolysis, and when stained revealed a large gram-positive bacillus. A culture from the abdominal incision was sterile. The organisms when injected into the ear vein of a rabbit had no effect. When the rabbit was killed and incubated a slight amount of gas was formed in the tissues. The organism when injected intramuscularly in the inguinal region of a guinea pig killed it, and produced a slight amount of gas in the tissues. The bacteriologic laboratory reported a large nonmotile, nonproteolytic, anaerobic bacillus, probably related to Bacillus oedematians.

The partial postmortem examination of the abdomen showed no infection in

*From Department of Obstetrics and Gynecology, Vanderbilt University.

the incision. The liver showed numerous areas of bile staining on the surface. The peritoneum, intestines, stomach, gall bladder, pancreas, spleen, kidneys, and uterus were all entirely negative. We were not permitted to open the area in the back. Cultures from incision and the liver blood were contaminated by bacillus subtilis.

Comment.—At the time of injecting the novocaine I believed the needle was in the sacral canal. Since the anesthetic failed and the patient complained of pain in her back so early following, I believe the novocaine was injected in the tissue to the left of the sacral hiatus. The patient was obese and the sacral administration quite difficult. The marked jaundice, nausea and vomiting, and extreme shock which followed show that the organism was a very virulent one. DaCosta in his *Textbook on Surgery* says that blood transfusions in acute septicemia are more often associated with reactions. In this case the blood transfusion might have hastened death a few hours. But the infection was one of such virulent nature, the jaundice so marked, and the patient's condition so grave, that nothing would have saved her life.

Some of the members of our hospital staff took the stand that a septicemia could not arise by any form of a gas bacillus being injected into the tissues. Since I have seen a case of gangrene following a circumcision under novocaine, and another case of gangrene following an operation for an ingrowing toenail under novocaine (in which the hallucis longus tendon sloughed and drop of the great toe followed), I believe the devitalization of the tissue caused by the novocaine associated with the organisms present made an ideal site for infection, not unlike the ones sustained during the world war with the bacillus of Welch or true gas bacillus.

It has been proved that some forms of gas bacilli live normally in the intestinal tract of about one-half of all infants before they are one year of age and in the intestinal tract of the majority of adults. I believe that this organism was present on the patient's skin and was carried in by the needle used in the administration of the sacral anesthetic.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

ABSTRACTS OF THE PROCEEDINGS OF THE FOURTH ANNUAL CONFERENCE OF THE STATE DIRECTORS OF THE ADMINISTRATION OF THE SHEPPARD-TOWNER ACT, HELD IN WASHINGTON, D. C., JANUARY 11-14, 1927

DENORMANDIE, ROBERT L., M.D.: **Maternal Mortality Studies.**

The schedule for this study was prepared in accordance with methods outlined in a previous paper by the author, entitled "How to Make a Study of Maternal Mortality." The first page of the schedule gives information derived from the birth and death certificates. The second page tabulates the care received during pregnancy, parturition and the puerperium. Pages three and four are taken up with the causes of death as found in the death certificate and a classification according to the International Classification. This standard schedule can be used for studies of maternal mortality to be conducted by State Boards of Health, Medical Societies and those trained in investigation and obstetrics. A study of this kind should bring out facts which would be comparable for different sections and countries and might serve as a basis for accurate knowledge on which possible improvement in obstetric practice could be based. The results of prenatal, natal and postnatal care could be analyzed. The results of home and institutional care could be compared. The results in different environmental conditions could be studied.

CROUGH, ELENA M.: **Foundation for Permanent Child Hygiene Program in New Hampshire.**

A sort of correspondence course for mothers and prospective mothers was carried on. Mature and experienced public health nurses were carefully selected and employed. The first step was to visit and secure the cooperation and help of local physicians. Attempts were made to get prenatal cases under the care of a physician as early as possible. Employment of local physicians in the clinics, the formation of permanent committees in the towns and villages, and obtaining permanent local appropriations and the utilization of county maternity and infancy nurses to carry out the general and detailed programs are the essentials of the work in New Hampshire.

FERRELL, JOHN A., M.D., DR.P.H.: **The County Health Organization in Relation to Maternity and Infancy Work and in Permanency.**

Local health service is essential in every state. It should be conducted in small territorial units, as the county. The goal should be an official service that is adequate, continuous, and permanent, supported by taxes and conducted by full time workers. Specialized training is not possible for those working in the smaller

centers. Health officers and workers should be well trained. Thoroughness and persistence are necessary, especially in dealing with maternity and infancy welfare measures.

FOX, ELIZABETH: **Standards for Training of Public Health Nurses.**

The excess of demand over supply of properly trained public health nurses, especially of those capable of maternity and infancy work, necessitates either filling the places with improperly equipped nurses or not meeting the demand at all. Standards have been formulated by committees of the State and Provincial Health Authorities, American Public Health Association, and the National Organization for Public Health Nursing. The nurses should be expected (1) to bring about in the community a higher valuation of human life and of the need for adequate prenatal, maternity and infant care; (2) to supply the knowledge which will lead to better prenatal hygiene and care of the infant; (3) to help produce the facilities which will make good prenatal and child care possible. This requires the proper viewpoint as well as special training and experience in addition to personality and character.

KUHLMAN, MATHILDE S., R.N.: **Methods of Training Staff Nurses in Prenatal and Infant Care.**

The training of staff nurses in prenatal and infant care in the State of New York has been more or less in process of evolution since 1922. The Public Health Council requires these nurses to be registered by the Regents of the University of the State of New York and to have had not less than two years' experience in public health nursing. An effort was made to secure nurses who had hospital training and postgraduate work in obstetrics and pediatrics. Each nurse coming on duty is required to spend a period for observation and instruction at the Maternity Center Association. A definite teaching center for these nurses came to be a necessity. Such a one has been established in Fulton, Oswego County. The Fulton Academy of Medicine voted unanimously for the establishment of a demonstration mother and child health station and appointed a medical advisory committee to cooperate with the nurse detailed to the work. The present facilities for training staff nurses include: Fulton Teaching Center, Children's Consultation Unit, Prenatal Consultation Units, Staff conferences with consultant nurses and directors, visits to Maternity Center Association, Field Center and other New York City organizations, and an annual conference of all health officers and public health nurses which is called by the State Commissioner of Health.

VEECH, ANNIE S., M.D.: **Obstetric and Pediatric Postgraduate Courses in Kentucky.**

For the past four and one-half years the Kentucky Bureau has made an unceasing effort to bring to the medical profession of the State the best information available concerning modern obstetrics and pediatrics. The methods used have included monthly articles on obstetrics in the State medical journal; reports on the handling of difficult cases of delivery in the Louisville City Hospital; cooperation with the medical department of the University of Louisville; an annual program incorporated into the yearly meeting of the State Medical Association; speakers loaned to the county medical societies; and demonstration health centers throughout the state. A special postgraduate course was given by Dr. Alice Webb Fallant during the past year before ten county and two district medical societies. This work had the approval and sponsorship of the State Board of Health and Medical Association.

ALLEN, JANE C.: **Supervision of Field Nurses.**

Maternity and infancy work is frequently carried to the lonelier rural sections where such care would otherwise be negligible or lacking. The increasing importance of the work to public health nurses and to the community is being shown in various ways by meetings, in current literature, and educational institutions. There is a growing conviction that proper supervision is the very hub of the whole wheel. Supervision entails certain obstacles and must accomplish certain ends. 1. The nurse is apt to resent it; the supervision must be tactful; it must secure cooperation. 2. It must be effective, requiring a complete grasp of details without obtrusiveness. 3. It must bring the small units up to the same standard and coordinate with the work of larger units. 4. It must be educational.

ALLEN, CORA S., M.D.: **Itinerant Conferences as an Advance Agent in Developing Permanent Centers.**

In Wisconsin the greatest need for a public health program has been in the rural communities. After the first year's work sixteen counties were chosen for monthly conferences and demonstration clinics. This led to a demand for permanent centers which increased from one to fifteen within a year. A big factor in the success of the permanent center is the trained public health nurse. The concensus of opinion is that one of the most effective ways of reaching an entire family is through a permanent center where results of right methods can be seen in the steady normal growth of children who attend regularly.

LOBENSTINE, RALPH W., M.D.: **The Tioga County (New York) Demonstration in Prenatal Care.**

The problem of providing expectant mothers in small towns and in rural communities with reasonable safeguards during pregnancy and labor is one that is surrounded, on the whole, with more difficulties than are encountered in urban communities. Some years ago a demonstration was undertaken in Tioga County, N. Y., to adapt the methods of the Maternity Center Association to rural communities. The State Health Department agreed to furnish the funds necessary to carry on a maternity nursing service by nurses from the Maternity Center Staff. Prenatal clinics were opened the last week of January in 1925 after enlisting the sympathy and interest of the county medical profession. By the latter part of the year, four nurses were working in the demonstration. By the end of the first year 247, or more than half of the pregnant women of the county had been under the nurses' care; 63 per cent of these women were referred by physicians. The nurses made 3020 home visits and attended 58 deliveries. In 1926 there were 253 new patients, of whom about 53 per cent were referred by physicians. During this year the nurses attended 111 deliveries. In 1926 the nurses made 3,293 home visits. There were no maternal deaths among the cases cared for by the nurses during either year.

HANNA, AGNES K.: **Analyses of Child Care Teaching and Little Mothers' Classes.**

Group teaching is an important aspect of a state maternity and infancy program. A definite policy in regard to such work should be developed in each state. Effective group teaching cannot be carried out sporadically, but must be a definite part of the permanent program of the community. It has been realized that the "little mothers'" classes which began as an extra-school or settlement activity belong in

the schools where the instruction can be given by teachers. Wisconsin is the only state that has a complete state-wide plan for teaching child care as part of its regular curriculum. The "little mothers" and mothers may also be reached through self directing study groups. It is possible to reach them by lectures and through class work. The State Department of Health can be of service by preparing study outlines and material and by securing lecturers and teachers for the various types of mothers' classes.

BRYDON, MARY E., M.D.: **Developing Permanent Health Centers.**

The modern public-health movement has three objectives: curative medicine, preventive medicine, and constructive health education. The practicing physician, surgeon, or specialist alone is concerned with handling the first. Health departments have initiated the second and third, but are urging that the physician take them over as a part of his work and that health education be made a part of the educational system. During the past twelve years the health center, the home of the local health department, has become an institution in public health work. In Virginia the health centers are varied both as to the types of organization and as to the nature of their activities. The larger cities, like Richmond and Norfolk, have health centers with a central office, in charge of a medical director who supervises the activities of small centers and stations. Maternity and infancy work is usually included in their programs. They always attempt to cooperate closely with all social welfare agencies. Ten cities in Virginia have health centers. The county health work is carried on through health centers and health stations, the latter being instruction and conference centers for mothers and children in charge of nurses. The state has five counties with a well-organized health center in each, and ten counties with a total of 37 health stations.

BAKER, S. JOSEPHINE, M.D.: **Preliminary Report of Possible Cost-Accounting System on Separate Items of Work Carried on under the Maternity and Infancy Act.**

A proper cost-accounting system on the separate items of work carried on under the maternity and infancy act must consider the conditions of work, the relative importance of the various items, the general methods of carrying on the work, and the most efficient administrative methods. Forty replies were received to letters and questionnaires sent out to all the State Directors. The rural problem was common to almost all the states. Different sections of the country have other general problems: the Southwestern States have a migratory population; the Northeastern States, a large alien population; the Southeastern States, the untrained midwives and the high death rate among the negroes; and the Northwestern States, a scattered population. The particular needs of the individual States were indicated by the most important activity. In nine it was general health education; in eight, prenatal instruction and care; in seven, cooperative work between the states and counties; in five, "little mothers' classes"; in three, supervision of midwives; in three, prevention of infant mortality; in three, lectures on obstetrics before medical societies and in medical colleges; and in one, preschool child work. The expenditures fall into two groups: First, those for intensive work in the immediate saving of lives; second, those for general public-health education. A method which may combine the intensive with the general educational method is that which results in the counties carrying on their own work. The state pays half and the county half of the cost. In nearly every state where this method has been tried there has been better cooperation on the part of the local medical pro-

fession. The information gained shows a complex problem, the solution of which must meet the local needs. No standardized methods would be equally effective in all. Each state must evolve its own methods and cost-accounting system.

HALL, CARRIE M., R.N.: **Training the Obstetric Nurse.**

Every state now has a nurse-practice act and many states have minimum standards of instruction and practice. One of the required subjects is obstetric nursing. Obstetric nursing practice is easily obtainable, but in general undergraduate nurses receive no prenatal instruction. This instruction can be obtained after graduation, through maternity centers and the maternity services in visiting-nurse associations. A four-month course in public health nursing has also been found helpful in giving an insight into the teaching of prenatal care. Nurses are occasionally called upon to deliver a patient and nurses feel that some training in the delivery of normal cases would be desirable. This problem is being studied by a joint committee from the National Organization for Public Health Nursing and the National League of Nursing Education.

RICHARDSON, FRANK HOWARD, M.D.: **Breast-feeding Demonstrations.**

Breast feeding should be presented not as a public-health measure, but as a private practitioner's method for feeding babies under his care. A breast-fed baby has five chances for life to the bottle-fed baby's one chance. Two essentials in breast feeding are (1) complete emptying of the breasts and (2) making up for any deficiency by giving a complementary feeding. If the baby does not empty the breast, this must be done by manual expression. Premature weaning is unnecessary, but is due to various causes. Binding the breasts and giving castor oil the first few days after confinement reduces the milk supply. Other causes are fissured nipples, nervousness, and lack of sleep. The nursing mother should eat as she pleases, take a quart of milk daily, some fresh cream, green vegetables, brown bread, and cod liver oil if necessary. Babies should not be fed in the horizontal position as the esophagus then lies below the food level and the air cannot escape. Four-hour feeding intervals are to be preferred. Milk analysis is of no value unless at least three specimens from each nursing of a twenty-four hour period are used. The only serious thing ever likely to be wrong with milk is its quantity.

MARRINER, JESSE L., R.N.: **Evaluation of Maternity and Infancy Work in a Generalized Program.**

The work of a committee to evaluate activities which may be accounted as maternity and infancy work included a survey of the situation in 26 states where Sheppard-Towner funds were being used to subsidize such activities. In answer to a questionnaire which twenty-two states answered it was stated by all that the funds were used to subsidize and maintain local or county activities in the public health nursing field. In nineteen states this was part of a generalized nursing program and in three it was a specialized maternity and infancy service. Eleven of twenty-one states had no contracts with county health organizations. In Alabama the time distribution and methods of supervision have been worked out as follows: A forty-four hour week is taken as a basis. A supervising nurse visits each organized county every month, studies and tabulates the activities as shown on the daily visit cards of each county nurse. The percentage of time given to each activity is worked out. This system has been on trial for only a few months, but a marked effect is already seen in more complete, accurate and intelligible daily records of the nursing work.

MOSHER, GEORGE CLARK, M.D.: **The Problem of Compulsory Notification of Puerperal Septicemia.**

Current American literature contains practically no expression of opinion in regard to compulsory notification of puerperal septicemia. No conclusive report on the working of the law was elicited by inquiry sent to boards of health in the states requiring notification. Questionnaires sent to officers of national medical and other interested organizations and a number of leading obstetricians and teachers in medical schools brought replies stating more or less definite opinions and furnishing information in regard to the situation. The gist of 16 replies from obstetricians, of 5 from state executives, and of one from a city executive is given. The opinions for and against compulsory notification and the exacting of a penalty are almost evenly divided, so far as definitely expressed. It is concluded that if notification is to be required the wording of the law should be considered with regard to the varied conditions that may cause pyrexia.

The two main weapons for reducing the mortality due to puerperal septicemia are:

1. Education. The obstetricians who now are in the schools and hospitals must be taught the fundamental principles of asepsis; and prospective mothers must learn to demand good care. When women realize that childbearing can be made safer, a powerful public sentiment will be aroused that can be utilized in reducing puerperal mortality.

2. Publicity. This affects the general practitioners now doing obstetric work and treating all sorts of suppurating wounds, erysipelas, and other virulent infections and rushing from the patient with temperature to the clean maternity patient and seldom changing their clothes or using sterile gloves in the delivery. Publicity furnishes the only means of impressing upon these men that a woman dying from puerperal septicemia after such needless exposure is doubtless a victim of carelessness or ignorance. It is not to be argued that compulsory notification will in itself achieve anything marvelous, and a punitive clause may not aid greatly; nevertheless the publicity coming from notification would make the physician who now scorns the extra precautions urged for the lying-in patient realize that to continue work in his community he must change his tactics even if no other penalty is to follow.

Every available means must be used to reduce puerperal sepsis whether or no we resolve that it should be made reportable. We must urge the medical schools to give due place in the curriculum to prenatal care, to management of normal labor, and especially to asepsis. We should institute a further campaign of education through state boards of health, state and county medical societies, health centers, and lay organizations having as its aim better maternity conditions.

Society Transactions

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING NOVEMBER 4, 1926

DR. JOHN M. LAFERTY described the **Postmortem Findings in Two Neonatal Deaths, Showing Congenital Absence of Both Kidneys; Dextrocardia and Fatty Degeneration of Liver.**

CASE 1.—Mother, white, aged 29, para v. The four previous labors and puerperia, were normal. The first three children are living and well. The fourth baby appeared normal at birth, but a few hours afterward it became cyanosed and died in about 36 hours. This death was reported as due to subdural hemorrhage. During the present pregnancy the patient had a mild toxemia according to St. Mary's standard and a slight cold during the fourth month. Her general condition was good, weight 154 pounds. Urine showed marked trace of albumin and sugar. No casts or other abnormal findings.

Delivery was spontaneous, second stage rather precipitate, about fifteen minutes in duration. Total time of labor three hours. Placenta delivered spontaneously within one-half hour. It appeared normal macroscopically. Baby cried vigorously and spontaneously after delivery and had a good color. About eight hours afterward it was noticed to be slightly cyanosed. The respirations became gradually more rapid and shallow and cyanosis deepened until baby died forty-eight hours after birth. A clinical diagnosis was made of dextrocardia with either (a) some other vascular anomaly or (b) a subdural hemorrhage, the result of the precipitate labor.

Postmortem Examination.—Weight 7 pounds 4 ounces, length, 49 cm. No external deformities. Skin and mucous membranes markedly cyanosed. Brain and meninges normal. Pericardium attached to right side of diaphragm, apex of heart on right side, great vessels normal, heart valves normal, foramen ovale and ductus arteriosus closed. Lungs had numerous small atelectatic areas scattered throughout, particularly numerous in right lower lobe. Microscopic examination showed a diffuse fatty degeneration.

Remarks.—The condition of the liver would indicate that death was the result of a toxemia. The origin of a toxin having such destructive effects on the liver is obscure. Three facts would tend to suggest a maternal origin. (1) The absence of any marked changes in the other organs. (2) The death of a previous baby with similar symptoms. (3) The presence of a toxemia, mild stage, in the mother.

CASE 2.—Mother white, aged 44, para, xi. Her ten previous labors, with the exception of one unnecessary forceps delivery, were spontaneous and normal. Puerperia were all normal. Nine of her children are living and well. One died of pneumonia at seven months. During her last pregnancy she had frequent attacks of nausea and vomiting, was somnolent, and dyspneic on exertion. No acute illness or injury.

Physical Examination.—Weight 157½ pounds. Tonsils normal.

The urine showed a trace of albumin, and positive reaction for acetone. No casts or other abnormal findings.

Labor normal and spontaneous, about ten hours. Membranes were ruptured artificially when head was at vulva. Only a small quantity of amniotic fluid escaped. Placenta was delivered normally within one-half hour. It was small and numerous infarcts were present. Microscopic examination showed chronic placentitis. Baby was cyanosed when delivered and breathed only after respirations had been started artificially by Schultze method. The respirations were gasping and slow, about six per minute. Artificial respiration was resorted to several times when breathing ceased. Heart stopped beating one-half hour after delivery.

Postmortem Examination.—Weight 6½ pounds. Length 48.5 cm. No external deformities. Brain and meninges normal, as well as internal viscera. Gall bladder was only a rudimentary cord. Bile duct patulous. The adrenals were both larger than normal, but no trace of either kidney. Both ureters were also absent as were the renal vessels. The urinary bladder was rudimentary with thick walls and having a capacity of only 1 c.c. Urethra was patulous. Umbilical vessels were normal. There was cryptorchidism on right side and tunica vaginalis was distended with clear serous fluid. Left testicle was normal.

DR. J. STUART LAWRANCE and DR. WILLIAM F. MOORE presented a paper entitled **Management of Pulmonary Edema of Eclampsia by Permanent Bronchoscopic Operation.** (See page 55, July issue.)

DR. LEWIS C. SCHEFFEY read a paper entitled **The Value of the Sugar Test in the Diagnosis of Pregnancy.** (See page 202.)

DISCUSSION

DR. JOHN COOKE HIRST, 2ND., said he had used the sugar test in nearly 300 patients, of which 180 were reported in his two papers. He never used the stated dosage of 120 gm. of sugar, but varied the dose according to the size of the patient, amounting to about 90 gm. for a patient of 120 pounds, and being never over 150 gm., in any case. Dr. Hirst regarded the dosage as very important and the results in his second paper showed an accuracy of 87 per cent, on pregnant and nonpregnant patients combined. At the University Maternity, the test was regarded as valuable for the diagnosis of a dead ovum, and was invariably used before cleaning out the uterus in any doubtful miscarriage. Dr. Scheffey's patients received considerably more sugar and perhaps that explained his high percentage of failure with false positive results.

DR. JOHN LAFERTY said that one significant factor was the blood sugar in toxemia of pregnancy, because women suffering from toxemia have a marked tolerance for glucose and in his experience as high as 50 gm. every three hours had been administered in severe cases without having any glucose eliminated in the urine at all.

DR. LEWIS C. SHEFFEY said that he may have read Dr. Hirst's article incorrectly; but he was quite sure that in his first paper he began with 100 gm. of sugar, later using 125 gm. His second paper, in which he described the use of 7.5 gm. for every 10 pounds of body weight, appeared six months after Dr. Scheffey had begun his studies in which 120 gm. were used. In view of Dr. Hirst's criticism that he used too much sugar, and thereby secured too high a percentage of positives in nonpregnant cases, it would seem that by the same reasoning he should have secured a higher percentage of positives in those definitely pregnant. This was well brought out in two of the ectopic cases, when we were

especially anxious about the diagnosis. Of course, Dr. Hirst reported a larger series of cases, but Dr. Scheffey felt that his number was sufficient to show the unreliability of the test.

DR. JAMES L. RICHARDS read a paper entitled **The Present-Day Indications for Treatment of Myoma Uteri.**

In this he reviewed a series of 140 consecutive cases of myoma from the gynecologic ward service of the Jefferson Hospital from October, 1921, to December 31, 1925.

Nine patients received no treatment for the following respective reasons: one had a symptomless myoma and relaxed pelvic floor. Perineorrhaphy was performed, no treatment was given the myoma. Two had myoma complicating pregnancy. One had paresis. One had cardiorenal disease and symptomless myoma. Four refused treatment.

Supravaginal hysteromyomectomy was the plan of treatment employed in 88 cases, abdominal myomectomy in 11 and vaginal myomectomy in 2. Concomitant adnexal disease required removal of both ovaries in 51 cases. One ovary was conserved in 29 cases and both were conserved in 8 cases. Two patients received radium treatment before operation and 27 were treated by radiation only. Five of the series had blood transfusion prior to operation, and two were transfused before irradiation. Eighteen, or 17.9 per cent of the 101 patients treated surgically had postoperative complications. Five developed bronchitis; two bronchopneumonia, and one lobar pneumonia. One had atelectasis, one pyelitis, two cystitis, two phlebitis, and two wound infections. One patient had a stormy convalescence, sputum and blood cultures negative, one a recurrence of an old tuberculous process.

Regarding operative mortality, three patients died of peritonitis giving an operative mortality of 2.97 per cent and a primary surgical cure of 97.03 per cent. There was no radium mortality; 62 of the surgical cases and 24 of the radium cases were examined in the dispensary subsequent to treatment or replied to questionnaires. Sixty of the surgical cases examined were cured anatomically and symptomatically, giving a late operative cure of 96.7 per cent. One patient had a mass in the left adnexal region and one developed carcinoma of the cervical stump, one year after operation, giving poor late results of 3.22 per cent. Forty, or 39.6 per cent were not heard from. Of the 24 radium treated patients who were examined or heard from in answer to questionnaires, 21 are symptom free, a late radium cure of 87.5 per cent. Three report return of bleeding, a poor late radium result of 12.5 per cent. Three were not heard from.

It is interesting to note the effect of adnexal treatment on subsequent menstruation, based on reports 8 months to 4½ years after treatment. Of 10 surgical cases in which ovarian tissue was conserved, 5, or 50 per cent report normal or nearly normal menstruation. Two of these patients had abdominal myomectomy and three had supravaginal hysteromyomectomy. Of 19 radium treated patients, 3, or 15.7 per cent report normal or nearly normal menstrual periods.

DR. STEPHEN E. TRACY believed that fibromyomas of the uterus seldom if ever underwent malignant changes, but in a certain percentage of cases are accompanied by malignancy of the uterus. In his experience the morbidity in myomectomy was not greater than in hysterectomy. On the contrary, it has been less. Panhysterectomy is a more serious operation and is attended with a higher mortality than is supravaginal hysterectomy. The increase in mortality from panhysterectomy over the supravaginal operation is greater than the percentage of subsequent malignant degenerations of the retained cervix. If a cervix is badly

lacerated or degenerated, a panhysterectomy should undoubtedly be performed. It is a very simple matter to destroy with the cautery the secreting portion of a normal cervix after the body of the uterus has been removed. The selection of the proper cases for the use of radium is a question of diagnosis.

DR. GEORGE M. BOYD asked in what proportion of the cases which were treated by radium and were found symptom free, was the tumor materially reduced in size? In his experience, this agent acted well in checking hemorrhage but in many cases had not materially reduced the size of the tumor so that the patient still has the tumor which may later on produce symptoms. He believed the use of radium will always be restricted because of the difficulties encountered in making a diagnosis.

DR. BROOKE M. ANSPACH considered that one of the most important things in Dr. Richards' paper was what he said about a preliminary curettage before using radium or deciding on the type of operation. Although mistakes will be made one can form a very reliable opinion from the gross appearance of scrapings. If the operation is preceded by curettage the operator may usually be sure whether or not there is a carcinoma which complicates the myoma. If there is a reasonable doubt the operation may be postponed until a microscopic examination of the scrapings is made. If a routine practice is made of cauterizing every cervix for the purpose of destroying, either an infection or an incipient malignant process, there will be a certain addition to the postoperative morbidity of supravaginal hysteromyomectomy, because of the sloughing cervices. Preliminary curettage reveals a cancer before the operation is begun: it is better to know then, for the supravaginal plan of removal may be abandoned at once in favor of a complete hysterectomy. When carcinoma is found only after the supravaginal removal of the uterus then the operator must remove the remaining portion of the uterus (cervix) at the risk of both infection and implantation of carcinomatous particles.

DR. RICHARDS (closing) said in answering Dr. Boyd that the patients who returned for examination all showed reduction of the size of the growth. Dr. Longaker asked the question about the menopausal symptoms in the symptom-free radium treated patients. These patients have menopausal symptoms, but judging from the replies received in answer to the questionnaires these symptoms, especially of the nervous system are not as marked as in the patients who received surgical treatment. It might be reasonable to suppose that the difference of the intensity of the menopausal symptoms is due to the fact that the action of the radium is two-fold in producing limited bleeding; its direct action on the endometrium and its indirect action on the ovary by atrophy of the primordial follicles. The patients in whom menopausal symptoms are less marked probably escape the indirect action of the radium on the ovaries.

DR. ALFRED HEINEBERG read a paper entitled **The Use of Radium in the Treatment of Certain Varieties of Endometrioma of the Recto-vaginal Septum.** (See page 235.)

DISCUSSION

DR. BROOKE M. ANSPACH said that endometrioma of the rectovaginal septum is often very difficult to remove by operation and a careful report, such as Dr. Heineberg has made, showing the success which may attend the use of radium in some forms, adds much to our therapeutic resources. Endometriomas are rather common and especially since Sampson called our attention to them they are recognized much more frequently. Up to that time their significance was

not altogether appreciated. A large factor in the successful treatment of endometriomata is the complete removal of ovarian tissue (castration). After the ovarian secretion is eliminated these new formations undergo atrophy. Dr. Anspach had several patients a year or two after operation, in whom good sized implantations were left in the wall of the sigmoid; these have given no symptoms and are not detectable by any methods of examination. Without any reasonable doubt they have regressed.

Dr. Graves, of Boston, at a meeting of the American Gynecological Society two years ago reported a case of what was taken to be an inoperable carcinoma of the rectum or sigmoid that had been cured by a hysteromyomectomy and removal of both ovaries; the tumor proved to be an endometrioma. If it is true that the removal of the ovaries will cure endometriomata of the rectovaginal septum, the operative resection of these growths which has a considerable mortality will not often be selected as the preferred method of treatment, and furthermore, if some of them can be treated with radium without oophorectomy it will, of course, be of the greatest advantage to the patient.

Irradiation therapy was then advised and an eight hundred milligram hour dose was applied.

A microscopic examination of some of the tissue revealed the tumor to be of the true müllerian type. Six months following operation the patient returned to the hospital complaining of severe bleeding. Biopsy again disclosed the tumor to be of the adenomyomatous variety. The patient was given a fifteen hundred milligram hour dose of radium and is now reported well.

DR. P. BROOKE BLAND reported three cases of vaginal adenomyoma, now designated by Sampson and others as endometriosis or endometriomata. The first case of this relatively uncommon type of neoplastic disease was a woman thirty-five years of age, the mother of four children. A clinical diagnosis of primary carcinoma of the vagina was made. The tumor, filling the posterior vaginal fornix, only after considerable difficulty was removed, but the patient remained well.

The second patient, a married woman, thirty-seven years of age and childless, presented a firm but nonfriable tumor filling the posterior vaginal fornix. Manipulation of the neoplasm provoked, as it did in all three of the cases, very free bleeding. A tentative diagnosis of primary carcinoma of the vagina was made. An attempt to remove the tumor by operation was not wholly successful.

The third patient was single and thirty-four years of age.

For three months previous to admission she had suffered with continuous vaginal bleeding, at times moderate, at other times severe, but of sufficient constancy and intensity as to cause a marked secondary anemia. A clinical diagnosis of primary carcinoma of the vagina had been made by the family doctor and likewise by the brother of the patient, also a physician. In this patient the typical firm, nonfriable, painless, mass was found filling the posterior vaginal fornix. A biopsy was performed and the true endometrial nature of the tumor disclosed. A fifteen hundred milligram hour dose of radium was applied and the patient is now reported well.

DR. HEINEBERG (closing) said it was gratifying to find others who had similar experiences in the treatment of adenomyoma of the rectovaginal septum, because eight years ago he presented a case of adenomyoma before this society and there was no member who had seen a case or was able to offer anything in the way of discussion. Dr. Bland's reports of his patients add much to the value of the use of radium in the type of case which appears to be malignant and to be so far advanced that, in the majority of instances, it cannot be removed by operation and which responds almost miraculously to the application of radium.

The Readers' Forum

CONDUCTED BY JOHN OSBORN POLAK, M.D.

The Value of the Sedimentation Test

Would you kindly discuss for me, in the "Readers' Forum," the value of sedimentation time in infections?

Very truly yours,

W. K. R., M.D.

The sedimentation time is that interval required for the setting out of the erythrocytes from a column of citrated blood in a standard calibrated tube. The normal time is above 120 minutes. The sedimentation time is of value in determining the presence or absence of infection. A rapid reading indicates the presence of infection either as localized accumulations or minute foci scattered throughout, occurring in any organ.

It has been used extensively in gynecology in determining the presence of complicating infections of benign tumor growths, and as an index of the severity of the process. It also aids to determine the best time to do elective procedures since frequently infection is present in spite of normal leucocyte count and a normal temperature. In such cases the sedimentation time is the only means of diagnosing coexisting infection.

Tuboovarian disease and pelvic inflammatory disease, occasionally become activated as indicated by recurrence of symptoms. The usual operations should be postponed until the sedimentation time is 90 minutes or over, in order to prevent stormy convalescence, added complications and a slower return to normal health. A reading of 30 minutes or under shows the presence of accumulated pus and conservative evacuation must be attempted.

The test has a definite place in the differential diagnosis of ectopic pregnancy and acute exacerbation of a chronic pelvic inflammatory process. A rapid reading would point towards infection; while the slow reading would be suggestive of ectopic.

The readings during pregnancy after the second month and in the puerperium must be excluded as the lowered reading cannot be explained on infectious basis. Likewise the readings for one week postoperative show changes which are apparently due to wound absorptions and tissue trauma; however, a continued low reading after the first week indicates the beginning of complications, such as, wound infection, peritonitis, perimetritis, and pelvic exudate.

Therefore, we may conclude from the results of many investigators that the sedimentation time has a definite diagnostic and prognostic value: First, a rapid reading means infection, a slow reading eliminates this possibility; secondly, it shows the existence of infection when the temperature and leucocyte count are normal, and thirdly, it may be of value in postponing elective operations in the presence of infection which might be activated by the trauma incident to pelvic surgery.

Several papers on this topic have appeared in recent issues of this Journal, see page 220 of this issue.

Department of Reviews and Abstracts

Conducted by Hugo Ehrenfest, M.D., Associate Editor

Selected Abstracts

Sterility and Sterilization

Mayer, A.: Sterility and Constitution. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxv, 21.

Constitutional anomalies especially hypoplasia and infantilism of the genitalia are more often the cause of sterility than we formerly believed. They relegate gonorrhea as a cause of sterility to the background. In the presence of infantilism, there is interference with the wandering of the sperm. A small external os may not be the cause of sterility but when it is associated with a stasis of the cervical mucus and a change in the hydrodynamics, sperm may find it difficult to enter the cervical canal. Tortuosity of hypoplastic fallopian tubes can prevent the transportation of ova as evidenced by the frequency of tubal pregnancies in cases of infantile tubes. Failure of the external os to dip into the seminal pool in cases of retroflexion also plays a rôle. The psychosexual constitution is likewise important.

There are, furthermore, biologic factors which affect the vaginal secretion. The endocrine glands, especially the thyroid, are important in sterility.

J. P. Greenhill.

Vignes, Henry: Concerning Certain Cases of Sterility and of Prenatal Death. Presse Médicale, Paris, May 24, 1924, p. 460.

Careful investigations have shown that in some animals intrauterine death is physiologic. Vignes therefrom concludes that at least some cases of intrauterine death in the human may be explained on the same basis. Some cases of human sterility or of intrauterine death furthermore may be analogous to the results of attempts at crossing two individual lower animals of different species, reasoning that biologically the two human individuals might be as far apart as the two lower animals.

E. L. King.

Hunner, Guy L. and Wharton, L. R.: Sterility. A Study Based on a Series of 526 Patients. Southern Medical Journal, 1924, xvii, 269.

The authors made observations on 526 private patients treated for sterility. The commonest cause of sterility was azoospermia, present in 20 per cent of the husbands studied, and usually associated with evidence of gonorrheal infection. In the female (a) about one-third had noticeable cervical discharges, 24.6 per cent became pregnant after treatment; (b) about one-seventh had an acid cervical leucorrhea; (c) one-sixth had pelvic infection, due in a majority of cases to puerperal or gonorrheal infection. Conservative surgery gave the best results; (d) one-seventh had retrodisplacements, less than one-third of which were uncomplicated.

Adherent uterus was the most frequent complication. Twenty-five per cent of the treated cases became pregnant. Uncomplicated retrodisplacement in itself is not a bar to pregnancy as four patients became pregnant after dilation of the cervix alone; (e) one-tenth had cervical stenosis, one-third becoming pregnant after treatment by passage of sounds, or dilation of the cervix. Indiscriminate use of the currette should be condemned; (f) one-eleventh had amenorrhea in varying degrees, only 8 per cent becoming pregnant after treatment. The indiscriminate use of the various glandular extracts is irrational and unscientific; (g) one-twelfth had developmental abnormalities; (h) one in twenty had uterine fibroids; of those treated by myomectomy, one-third became pregnant; of those treated otherwise only 10 per cent became pregnant; (i) one-twelfth show no cause for the sterility.

Artificial insemination was done twice, one of the patients conceiving.

Transuterine inflation of the tubes is of distinct value and shows inpervious tubes in 30 to 45 per cent of cases of sterility. The therapeutic value of the Rubin test is not yet established. The only case of pregnancy following its use proved to be extrauterine. F. J. SOUBA.

Peham: The Question of Spermimmunity. Deutsche Medizinische Wochenschrift, 1925, li, 2119.

The author placed spermatozoa from the husbands of 100 women in blood serum from their wives and noted the length of time that the spermatozoa lived. The average time was 9 to 10 hours with a variation of 2 to 13. In experimenting several times with the same couple there were variations up to 6½ hours in the series. He concludes that one cannot diagnose spermimmunity from a serologic point of view. PEMBERTON.

Kok, F.: Tubal Peristalsis and the Influence of Pharmacologic Substances on Spontaneous Activity. Medizinische Klinik, 1925, xxi, 1694.

The author performed experiments on 140 human and animal fallopian tubes and found that the predominant type of movement seen was peristalsis and this was in the direction of the uterus. During pregnancy the activity in the tube is markedly diminished. In a pregnant cow the author observed that the tube of the pregnant horn showed much less activity than the tube of the nonpregnant horn. Tubes show changes in motility also during the different phases of the menstrual cycle. This difference in activity is most likely dependent upon a hormone. J. P. GREENHILL.

Kok, F.: The Cause of Sterility and Tubal Pregnancy Based Upon New Investigations of Tubal Functions. Monatsschrift für Geburtshilfe und Gynäkologie, 1927, lxxvi, 32.

Kok found that diverticula occurred in about 20 per cent of the tubes of swine. If the theory of tubal diverticula as a cause of ectopic pregnancy is correct, then tubal pregnancy should be a common occurrence among swine, but there are only two cases known of tubal pregnancy among these animals. Furthermore, a fertilized ovum can seldom be caught in a diverticulum because the ovum is fertilized not in the ampulla but in the isthmus of the tube. Kok concludes that tubal pregnancy is etiologically connected with disturbances in the mechanism of the transportation of the ovum. The cause of these disturbances lies with the hormone elaborated by the fertilized ovum, so that satisfactory peristalsis is not initiated at the proper time. Abnormal contractions may be responsible not only for tubal pregnancy but also for sterility. These contractions may be experimentally influenced by stimula-

tion of nerves and by colloid changes. With excessive stimulation a spasm of the isthmus, if maintained long enough, may result in organic changes and these may be responsible for tubal pregnancy. J. P. GREENHILL.

Geist and Goldberger: A Study of the Intramural Portion of Normal and Diseased Tubes with Special Reference to the Question of Sterility. Surgery, Gynecology and Obstetrics, 1925, xli, 646.

The studies on the intramural portion of normal and diseased tubes were carried out on extirpated organs which were injected with 20 per cent sodium iodide solution, x-rayed, and cut as interrupted serials.

It was found that variations in the course of the intramural portion of normal tubes may offer a bar to impregnation. Intramural lesions may make the passage of sperma or ova impossible and they may be present with or without closure of the fimbriated extremity. It may be possible to get a positive or negative insufflation test in diseased tubes. A positive insufflation test means that tubes are patent to gas under pressure, not necessarily to spermatozoa or ova. It is essential to locate the occlusion in a case with a negative test if any reasonable hope of assistance from operative procedure is to be entertained. WM. C. HENSKE.

Rubin, I. C. Tubal Patency: Journal of American Medical Association., 1925, lxxxiv, 486.

The most suitable time for testing tubal pateney is the postmenstrual phase, between the fourth and seventh day after cessation of the menstrual flow. It is then that the endometrium is at its thinnest and its secretion reduced to a minimum. The chances for interfering with an existing pregnancy or of displacing an unimpregnated ovum are practically eliminated if this phase of the menstrual cycle is chosen. The possibility of displacing endometrial particles through the tubes in the sense of Sampson's theory is given when insufflation takes place in menstruation or during bleeding on account of any other cause. The writer admits the possibility of gas embolism when the endometrium is traumatized. Pressure should not exceed 200 to 250 mm. Attempts to open the tubes by higher pressure must be avoided. GROVER LIESE.

Rubin: Diagnostic Value and Therapeutic Application of Peruterine Insufflation of the Fallopian Tubes in Cases of Sterility. American Journal of Surgery, 1926, i, 1.

Rubin's early experience with collargol, thorium, bromide and iodide solutions for testing tubal pateney was unfavorable because of peritoneal irritation. Oxygen therefore was substituted and injected until the abdomen was seen to rise, the patient complaining of epigastric pain and distension. This led to the present method of using a small amount of carbon dioxide. Less than 150 c.c. are required. The most favorable time to carry out insufflation is from four to seven days after the cessation of a menstrual flow. One hundred and two pregnancies were observed after peruterine insufflation, 63 times in cases of primary sterility and 39 times of relative sterility. WILLIAM KERWIN.

Ott, D.: The Present Status of the Methods Used to Test Tubal Patency. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 58.

The author considers the Rubin test and its modifications a dangerous procedure and therefore has never used it. In its place he injects into the peritoneal cavity an indifferent powder dissolved in salt solution. If the tubes are open these

particles of powder may readily be seen in the cervical canal in about 24 hours. This test was performed in only six cases. The method is simple and requires no special apparatus and has no dangers. J. P. GREENHILL.

Kok, F.: Tubal Patency Test in the Diagnosis of Sterility. Medizinische Klinik, 1926, xxii, 1634.

The tubal patency test is not a harmless procedure. The greatest danger is that of pulmonary embolus. A further advance along the lines of testing out the fallopian tubes has been the injection of substances which can be seen on x ray plates. The instillation of a 20 per cent sodium bromide solution produces a hyperemia of the tubal mucosa. Lipiodol and iodipin, while very useful also have certain disadvantages. Great force must be used to inject these substances which means that the uterus is markedly distended before the tubes are filled with the oil. In addition to air embolism, these substances invite fat embolism. An attempt to point out the exact site of tubal occlusion by means of these substances, is only rarely successful. The author, after trying various media finally returned to the transuterine injection of normal saline solution for the purpose of testing the patency of tubes. A small amount of methylene blue is added to detect any return flow from the cervix. Not only is saline solution less dangerous than all other substances, but it also passes through the tubes with even greater ease than does air. No bad results were noticed in any of his tests. J. P. GREENHILL.

Serdukoff, M. G.: Methods of Diagnosis of Tubal Sterility. Gynécologie et Obstétrique, 1926, xiv, 111.

The author studied 64 cases of sterility, 28 primary and 36 secondary. There was nonpermeability of the tubes in about 65 per cent which figure agrees roughly with that of other observers. Of the several methods for studying the condition of the tubes, salpingography is the most rational and best. It should be preceded by insufflation which may show complete occlusion and obviate the necessity of further tests. All patients should be hospitalized, and blood counts, Fahraeus reaction, and a study of the vaginal flora should be done. Contraindications are: acute or active disease of the pelvic organs, pregnancy, virulent flora or pus condition of the vagina, erosions, endocervicitis or proximity to the menstrual period. No important harmful result was observed. Heat to the abdomen is indicated following the injection.

The diagnosis by salpingography was clear in about 75 per cent of the author's cases. This method together with insufflation comprise invaluable additions to our diagnostic equipment, but are still capable of error in technic and interpretation.
GOODRICH C. SCHAUFFLER.

Béclére, C. M.: The Importance of Precise Measurement of Pressure During Intrauterine Injection of Lipiodol. Gynécologie et Obstétrique, 1926, xiv, 104.

The pressure at which lipiodol is injected into the tubes should be measured by a manometer connected into the syringe system by a T tube. Thirty mm. of mercury is the optimum pressure. The author has shown by operation following injection, and by reinjection during operation that this pressure is sufficient to fill any tubes which are not definitely occluded. Pressures above 40 mm. are dangerous. The circulatory system may be invaded by the lipiodol as shown by experiments on postoperative specimens. No harm has been observed in over 30 cases injected at 30 mm. pressure. The author prefers a rubber to a metal sound for the injection. GOODRICH C. SCHAUFFLER.

Schwarz, G.: The Treatment of Female Sterility. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 283.

In about one-third of the cases of sterility the male is at fault and in another one-third the woman but only because of disease contracted from the husband. Hence in only one-third of the cases is the woman basically to blame for sterility. Among every one hundred women who have no children during the first two years of married life only 49 subsequently have children.

Of 326 patients who were operated upon for sterility at the Marburg Clinic 259 were traced and of this number 89, or 33 per cent became pregnant after the operation. The latter consisted of dilating the cervix, curettement, irrigation of the uterus with sodium chloride and incision of the posterior lip of the cervix. A metal tube was then inserted to maintain the patency of the cervix and this was left in place for five to six days. On two occasions the uterus was perforated and perhaps also in a third case. All three patients recovered and one of these had two normal pregnancies subsequently.

Among 58 patients with normal genitalia who became pregnant after operation 16 miscarried but 11 of these later had full-term pregnancies. Among 23 patients with hypoplasia, 4 became pregnant after the operation (17.4 per cent). Among 58 patients who had an Alexander-Adams operation in addition to the above procedure (with omission of the metallic tube) 24 became pregnant after operation (41.4 per cent). Eight of these women had abortions, but five of them subsequently had full-term pregnancies. J. P. GREENHILL.

Strassmann: Plastic Restoration of Continuity Between the Tube and the Uterus—Implantation of the Tube in the Uterus. Zentralblatt für Gynäkologie, 1924, xlviii, 1681.

Strassmann reports a case where, owing to the presence of an ovarian tumor with an interstitial pregnancy, one tube was removed completely and also the uterine end of the opposite tube. The distal portion of the severed tube was then implanted into the uterine cornu in the same manner one would implant a cut ureter into the bladder.

In a second case, a bilateral salpingitis, a new ostium was made on one side, after resection of the fimbriated end; and on the opposite side, which was the seat of a salpingitis isthmica nodosa, a portion of the tube was resected and the distal portion implanted into an opening made into the uterine horn.

The possibility of making use of this operation in the case of interstitial or tubal pregnancy is important. The author also suggests the possibility of making use of the vermiform appendix as a tube where both fallopian tubes have been removed. LITTLE.

Ritter, O.: Salpingostomy in the Treatment of Sterility Due to Tubal Occlusion. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 70.

Salpingostomy was performed on 65 patients, both unilateral and bilateral. Of these, 6 could not be traced, 8 were not married, and 7 who had one normal tube and a salpingostomy on the other side became pregnant. There were no pregnancies in 40 cases where the mended tube or tubes were the only paths for the ova. Four patients, however, did become pregnant who had only one tube and that the one operated upon. Only one of these patients went to term. Two others had a miscarriage, while the third had a second ectopic pregnancy. Salpingostomy, therefore, yielded only 9 per cent of pregnancies (4 out of 44). In performing salpingostomy two conditions are necessary, first, the path leading from the tube to the uterus must be open and second, the artificial opening must remain patent. The

best results are obtained in the cases where tubal occlusion is due to sepsis, while the least favorable results are in the cases due to gonorrhea and tuberculosis. After plastic operations on the tube patency must be maintained by tubal insufflation and heat.

There need be no fear of ectopic pregnancy after plastic operations on the tube. The patient who had a tubal pregnancy after operation had had the other tube removed because of the same condition and evidently she had a predisposition to ectopic pregnancy. A greater disadvantage of plastic operations is the tendency to abortion. This may be due to the fact that the fertilized ovum has only a short distance to travel and hence reaches the uterus before it has arrived at the stage of development required for implantation. Abortions may also be due to the cause of the tubal closure, namely, tuberculosis, perimetritis, etc.

J. P. GREENHILL.

Fuchs, H.: Pertubation and Salpingostomy in the Treatment of Sterility. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxv, 56.

According to Fuchs, there are in the German literature only 5 reported cases where pregnancy followed as the direct result of a tubal patency test. He reports nine additional cases. In eight of these patients the pregnancy continued to full term. In 5 of the 9 cases the ovum of the next menstrual cycle was fertilized Aside from the gross mechanical effect of blowing air through the tubes, the author believes that pregnancy follows this procedure because of the hyperemia and mobility of the tubes produced by the injection of a gas. The author's 9 successes occurred in a series of 100 tubal patency tests.

Among 34 women who were followed after plastic operations on the tubes, 2 were found who became pregnant. One patient had an intrauterine pregnancy which went to term and the other had an ectopic pregnancy. In the literature there are only 4 additional cases where an ectopic pregnancy followed plastic operations on the tubes. All of these occurred in the tube left after removal of the other tube for an ectopic pregnancy. They indicate that when a tube is removed for an ectopic pregnancy and the other tube is found closed, the latter should not be opened because the endosalpingial changes in it predispose to an ectopic pregnancy. The fact remains that after salpingostomy operations there occurred 40 intrauterine pregnancies and only one ectopic pregnancy, if we omit the cases of repeated ectopic pregnancy just mentioned. After plastic operations the tubes should be tested with air for patency and in two-thirds of the cases they will be found open.

J. P. GREENHILL.

Mandelstamm, A.: Tubal Implantation into the Uterus. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxiii, 138.

The author reports 8 cases of tubal implantation in all of which the Rubin test had previously failed to demonstrate patency. Before the tubal implantation operation the following points were made certain: (1) A normal sediment reaction; (2) normal urethral and cervical secretions; (3) clean vagina; (4) normal size and mobility of the adnexa; (5) potency of the husband. In these cases the tubes were implanted into the uterus through an incision in the posterior wall. The cases were subsequently tested for tubal patency but no gas passed through the tubes. In two additional cases in which the intramural portions of the tubes were removed by a circular incision, and the tubes implanted into the cornua, subsequent Rubin tests were positive. The author points out that normal anatomic relationships must be maintained, hence the tube should be implanted in the uterine cornua after the removal of the obliterated intramural part. To make certain that the

tubal orifice remains patent it is advisable to divide the proximal end into two flaps and sew the mucosa to the serosa. The length of the implanted part should be as great as the interstitial portion removed. J. P. GREENHILL.

Unterberger, F.: Plastic Operations on the Tubes, Tubal Insufflation, and Tubal Implantation. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 63.

In certain cases of tubal occlusion an attempt should be made to secure patency by operation. The author makes a T-incision in the occluded tube and everts the edges of the wound with catgut sutures. The ovary must be free and new wound surfaces avoided. Nearly always the operation is combined with a ventro-fixation. This operation was performed 57 times by the author, in most cases as an accessory operation to the main indication for laparotomy. There was no mortality and five women (8.77 per cent) became pregnant after the operation. In four of these five patients tubal closure had been due to perisalpingitis and in only one had there been an endosalpingitis.

The author has also performed tubal implantation three times. In the first case a Rubin test after the operation showed that the implanted tube was patent. In one case no menses appeared after operation and this patient is now pregnant after 11½ years of sterility. This is the first case of pregnancy following a tubal implantation in Europe. The author believes this patient should be delivered by cesarean section because the site of implantation into the uterus is a locus minoris resistentiae. Whether the danger of rupture of the uterus after tubal implantation is greater than the scar left after a deep myomectomy is still an open question. J. P. GREENHILL.

Cullen: A Normal Pregnancy Following Insertion of the Outer Half of a Fallopian Tube Into the Uterine Cornu. Bulletin of the Johns Hopkins Hospital, 1922, xxxiii, 344.

Patient was operated upon October 6, 1919, for left cornual pregnancy. This was removed, saving the outer half of the left tube and suturing its inner end into the uterine horn. Her right tube and ovary had been removed by another surgeon several years before. On March 11, 1921, she had a stillborn child at the end of the seventh month of gestation. There was a placenta previa. June 26, 1922, she had a normal labor and a living child. C. O. MALAND.

Reist: The Dangers and Results of the Use of Contraconceptive Instruments Such as the Obturator, Sterilet or Fructulet of Nassauer. Schweizer medizinische Wochenschrift, 1924, liv, 650.

A large number of infections and deaths occur from the use of various instruments employed for the purpose of preventing pregnancy. He condemns in no uncertain terms the use of the contraconceptive "pessary" of any sort and offers the following list of cases he has collected: Deaths—general peritonitis and sepsis 17; widespread parametritis 70; general peritonitis 38; pelvic peritonitis 6; septic abortion 62; damage to uterine wall by instruments 5; perforation of uterus 1; of bladder 2 and of pouch of Douglas 1.

Septic endometritis with involvement of surrounding tissue 75; pressure ulcers of cervix or uterine body 12; uncontrollable uterine bleeding 60; crampy uterine pain 28, and ectopic pregnancies 4. A. C. WILLIAMSON.